Well-Being and Health:
Evidence That the Health Benefits of Well-Being Are Contingent on Cultural and Personal Factors

by

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Dedication

This dissertation is dedicated to my family. Thank you for supporting me through every path.

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Abstract

This dissertation examines how the relationship between eudaimonic well-being and health is contingent upon socio-cultural and personal factors. Although eudaimonic well-being has been thought to have salubrious health effects, this dissertation provides evidence in three separate papers that there may be conditions under which additional factors are necessary for eudaimonic well-being to be beneficial, as well as conditions under which it may backfire. Chapter 1 provides an introduction to eudaimonic well-being, a brief overview of the literature on cultural influences on psychological processes and their relation to health, and a brief explanation of how adverse life experiences negatively affect the nervous system and health. Chapter 2 assesses the association between purpose in life and health across cultures, addressing the possibility that a sense of purpose in life may not necessarily directly be beneficial for health in a collectivist culture. It finds that, among Americans, purpose in life consistently predicted better biological health. However, purpose only predicted better health among Japanese who are sufficiently high in gratitude. This is perhaps due to how some purposes may be perceived in collectivist culture, requiring a social virtue such as gratitude to mitigate any potential costs. The third chapter compares victims of sexual assault with their peers who have never experienced an assault with respect to well-being and health. It finds that the victims of sexual assault are lower in eudaimonic well-being than their peers and rate themselves as having having poorer health, although their biological health does not differ. Additionally, it finds that the relationship between assault history and self-rated health is mediated by eudaimonic well-being, as well as neuroticism. Chapter 4 focuses on victims of childhood sexual abuse, assessing the relationship

between the severity of their abuse and their health, and whether this relationship is moderated by their eudaimonic well-being. It finds that, among those who experienced the most severe abuse, a high sense of well-being is associated with poorer health outcomes, perhaps due to a conflict between current beliefs and past experience. While eudaimonic well-being is generally thought to be beneficial for health, this effect is present only when one's well-being is congruent with one's culture and prior personal experiences. In the final chapter, I review the present findings and suggest the need for further research both on other conditions under which eudaimonic well-being is not directly linked with better health, as well as further investigation into why well-being appears to backfire under certain conditions.

Chapter 1
Introduction

Eudaimonia is an Aristotelian concept that refers to "the good life." Psychological research uses the concept of eudaimonic well-being to refer to one's sense of flourishing in life, such as a feeling that one has a purpose for their life, or whether they feel a sense of control over their environment. This is in contrast to the psychological concept of hedonic well-being, which refers to the feeling of pleasure (and avoidance of pain), along with satisfaction with one's life (Keyes & Annas 2009; Ryan & Deci, 2001). Eudaimonic well-being is seen as a significant aspect of meaning.

One overarching theme of this dissertation is the examination of whether meaning in life, particularly eudiamonic well-being, might influence health in general, and biological health in particular. To the extent that this influence can be identified, we investigate the conditions in which said influence is most pronounced, as well as under what conditions the influence is minimized. Particularly, prior evidence regarding the relationship between both socio-cultural and personal factors with health suggest that any relationship between eudaimonic well-being and health may be affected by these factors.

There is a growing body of evidence that epidemiological and psychological factors affect health. For example, socio-cultural factors, such as family background, have been linked with health. Epidemiological research has demonstrated that those born to mothers who survived

the Holocaust report poorer health and greater use of hypertension medication than their peers, suggesting environmental and social influences on biological health outcomes (Flory, Bierer, & Yehuda, 2011). In addition to such social contextual effects, psychological traits have been connected with disease and health outcomes. For example, positive emotions have been linked with decreased risk of developing a cold when exposed to the cold virus (Cohen et al., 2003). Further, a sense of purpose in life, an aspect of eudaimonic well-being, functions as a protective factor against heart attack among those diagnosed with heart disease (Kim et al., 2013). This relationship between eudaimonic well-being and positive health outcomes may suggest that eudaimonic well-being is associated with underlying biological health.

This dissertation examines how eudaimonic well-being interacts with socio-cultural and personal factors in order to influence health. It is comprised of three papers that assess this relationship. The first questions whether a sense of purpose in life is associated with biological health across cultures. The second assesses whether there is a relationship between sexual assault history, eudaimonic well-being, and health. Finally, the third study assesses whether eudaimonic well-being can serve as a buffer against any ill health effects of childhood sexual abuse. The following reviews the chapters to come.

Chapter 2, the first paper, addresses a specific element of eudaimonic well-being: a sense of purpose in life. It examines how purpose in life is associated with health outcomes across cultures. Previous research has noted that the relationship between psychological factors and health can differ across cultures due to differences in self-construal or in how those traits function differently across cultures. Self-construal refers to the conception of the self, and this has been found to differ between those in the United States and those in Asian societies. Those in

the United States, and the West in general, endorse a view of the self as independent from others (Markus & Kitayama, 1991). There is a focus on internal attributes that separate self from others. Independent people are more likely to engage in self-enhancement, motivated to confirm beliefs that they possess desirable traits. (Kitayama et al., 1997). In contrast, those living in Asian societies are more interdependent (Markus & Kitayama, 1991). A sense of connectedness with others is highly valued, and one's self is made meaningful through one's relationships (Kitayama et al., 1997). Those who are interdependent are concerned with maintaining these personal relations, and thus possess a strong commitment to pursuing social and communal goals (Kitayama et al., 2006; Oishi & Diener, 2001). While those in the West can also find meaning through relationships and a sense of belonging (Lambert et al., 2013), they do so by using these relations as a means to evaluate the worth and value of the personal self. The uncovering of this cultural difference in the conception of the self has opened the door to a wealth of research that calls into question whether traditionally held findings categorize "the way humans are," or if it merely assesses the way humans are within the United States. Cultural differences in independence and interdependence can drive differences in how psychological processes relate with one another, as well as how they relate to health.

Cultural differences related to independence and interdependence have been linked with biological health outcomes. These findings have called into question traditionally held views of how psychological factors relate to health. For instance, it has traditionally been viewed that the trait neuroticism is negative, as it is associated with poor health in the West (Smith & MacKenzie, 2006). However, neuroticism has been found to be associated with reduced biological health risk, i.e. better health, in Japan (Kitayama et al., 2018). This finding is

accounted for by the psychological factor behavioral adjustment, a trait more normative in Japan than in the United States. Those who are both high in neuroticism as well as more capable of adjusting their behavior have positive health outcomes. For those high in behavioral adjustment, neuroticism may be beneficial because it allows one to be more alert and aware of situations that require adjustment. Japanese appear to draw health benefits from neuroticism (but Americans do not) since, relative to Americans, Japanese are higher in behavioral adjustment.

In addition to the evidence that personality traits relate differently to health across cultures, evidence suggests that the relationship between behavior and health varies as well. The relationship between the expression of anger and biological health risk is moderated by culture. Within the United States, expressing anger is associated with poorer biological health. However, the opposite relationship is found in Japan, wherein the expression of anger is predictive of better health (Kitayama et al., 2015). This is likely due to cultural differences in the function of expressing one's anger. Within the United States, those who are of lower social status express more anger, and this anger is due to frustration (Park et al., 2013). One experiences frustration due to negative circumstances, such as something preventing them from achieving their goals. Thus, in the United States, the expression of anger is associated with negative situations in which one feels powerless. Conversely, those in Japan are more free to express anger when they are of a higher social status or a position of authority (Park et al., 2013). Being of high social status is associated with less threats to the self, which may explain the link between anger expression and positive health outcomes in Japan.

These findings regarding cultural differences in the relationship between psychological factors and health suggest that eudaimonic well-being may relate differently to health across

cultures as well. As stated above, Chapter 2 examines purpose in life, a specific aspect of eudaimonic well-being. A sense of purpose in life has been associated with positive health outcomes such as longevity (Hill & Turiano, 2014), and Ryff, Singer, & Love (2004) found that purpose is associated with lower inflammation among American women over the age of 60. Because of the associations between purpose and positive health outcomes, it is possible that purpose is associated with lower cardiovascular risk and lower inflammation. Additionally, this study addresses the role of gratitude alongside purpose in life as a predictor of health. The main goal of Chapter 2 is to examine the extent to which the effects of purpose and gratitude would extend across two disparate cultures, the United Sates and Japan. It finds a significant cultural difference in how purpose in life and gratitude relate to health.

Chapters 3 and 4 draw from previous literature on the relationship between stress and health in order to assess how traumatic experiences such as sexual assault or childhood sexual abuse are associated with the relationship between eudaimonic well-being and health. One aspect of health that has been shown to be impacted by life stress is inflammation. Inflammation is the body's response to injury, recruiting leukocytes to repair damaged tissue, and it is an important aspect of biological health (Hotamisligil, 2006; Gabay, 2006). While acute inflammatory responses are beneficial, chronic states of inflammation are detrimental. Chronic inflammation disrupts immune response and in fact damages tissue. It is associated with a number of diseases, such as cancer and autoimmune disorders (Coussens & Werb, 2002; Gabay, 2006). Those who experienced trauma during development are more likely to have chronic inflammation as adults, due to the way that trauma shapes the way bodily systems operate, creates a sense of hyper-vigilance, and shapes behavior (Miller et al., 2011).

Stress that occurs outside of childhood development is also linked with health outcomes. Chronic stressors such as being a caregiver for a spouse with dementia or Alzheimer's have been associated with poorer self-rated health, poorer immune function, and earlier mortality (Slopen et al., 2007; Schulz & Beach, 1999; Shaw et al., 1997; Esterling, Kiecolt-Glaser, & Glaser, 1996). The experience of trauma has been associated with poor health outcomes, which Perlin et al. (2005) propose may be in part due to how one trauma can lead to secondary stressors, and those secondary stressors lead to poor outcomes. For example, someone's relationships or education may suffer following a traumatic event. Thus, there is reason to believe that traumatic experience, such as sexual assault or childhood sexual assault, may be associated with biological health. Further, any relationship between the two may be affected by eudaimonic well-being.

Chapter 3 responds to a need for further study of the relationship between sexual assault history, health, and psychological outcomes. Namely, it measures differences between those who have and have not been sexually assaulted, identifying psychological factors that mediate the relationship between assault history and health among Americans. It finds that those who have been sexually assaulted report more chronic health conditions and poorer self-rated health than those who have not, though the two groups do not differ with respect to biological measures of health. The study finds that the relationship between assault history and self-rated health may be due in part to psychological factors associated with victimhood. Sexual assault is associated with increased neuroticism, which in turn compromises health evaluations. Alternatively, this may occur because sexual assault history is associated with lower eudaimonic well-being, which could also compromise health evaluations. Additionally, the study examines the victims of

assault and their self-reported long-term negative effects of the assault. It finds that a victim's perception of the effect the assault had on their life is associated with neuroticism, but not health.

Chapter 4, the third paper, addresses specifically those who were sexually abused during childhood, assessing the relationship between the severity of the abuse one was exposed to and biological health risk in adulthood. We argue that those who have experienced more severe abuse would have poorer biological health in adulthood, given the above statements regarding trauma and inflammation. Further, we suggest that any relationship between the severity of abuse and biological health risk may be moderated by a sense of meaning, assessed with eduaimonic well-being and a sense of control. Specifically, of interest is whether these factors of meaning could serve as a buffer against any ill health effects of abuse. Prior evidence regarding the relationship between eudaimonic well-being and health, as well as research regarding sense of control's ability to buffer against ill effects of adversity, suggest that these traits could be protective against ill health outcomes for those who experienced abuse. This study finds that a sense of eudaimonic well-being, as well as one's sense of control, do indeed moderate the relationship between abuse severity and health. Specifically, these factors are associated with positive health outcomes among those whose abuse was less severe, but are conversely associated with poorer health outcomes among those whose abuse was more severe. These findings may be due to how factors related to meaning may function among those who have had negative experiences. Childhood sexual abuse is likely to alter the way victims perceive the world, specifically leading them to see it and others as threatening.

These papers each assess the relationship between eudaimonic well-being and health. By assessing this relationship among different populations, I am able to address multiple needs in

the literature. Chapter 2 addresses the need for research across cultures, as well as research that investigates whether gratitude serves to mediate the connection between purpose in life and biological measures of health. Ultimately, it finds that the connection between purpose in life and health is not identical across cultures. Chapter 3 provides an assessment of how those who have experienced sexual assault fare in terms of both biological and self-rated health, comparing them to those who have never experienced such an assault. It allows for further understanding of how psychological factors such as eudaimonic well-being and neuroticism impact one's self-assessments of health. Chapter 4 responds to a need to assess health outcomes in adults who experienced sexual abuse in childhood. It finds that the relationship between abuse severity and health is moderated by one's sense of eudaimonic well-being, an effect unique to sexual forms of abuse. The following papers seek to address needs in the literature that further understanding of how one's eudaimonic well-being relates to their health.

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Chapter 2

Does Purpose in Life Always Predict Biological Health? Moderation by Culture and Gratitude

In his famous book, "Man's Search for Meaning," Viktor Frankl (1985) vividly described how purpose in life is often an important source of resilience at times of adversity. Indeed, having a strong sense of purpose affords clear direction in living one's life and thus proves crucial in orienting the self in social and personal space (Taylor, 1989). Purpose in life can also afford reasons to be disciplined and to stay away from purely hedonistic activities. It may then be the case that a purposeful life is not only a good life but also a healthy life. In the current work, we argue that there is some kernel of truth in the putative association between purpose in life and health. However, we also propose that in cultures that place a strong value on interdependence of the self with others, such as Japan, purpose in life may not always be unequivocally positive, as its pursuit may be seen as too personally focused. Thus, there may be some ambivalence associated with strong purposes in such cultures. To offset this ambivalence, individuals in these cultures may also have to be virtuous in some pro-social domain. In the present work, we examined the role of gratitude as one important pro-social virtue that may serve this function.

Purpose in Life and Health

The hypothesis that purpose in life has salubrious effects has received substantial empirical support. For example, purpose is reliably associated with an increased likelihood of engaging in health-enhancing behaviors. Specifically, those with a purposeful life are more likely

to get cancer screenings when they go to the doctor (Kim, Strecher, & Ryff, 2014), sleep an optimal amount and have better quality of sleep (Hamilton, Nelson, Stevens, Kitzman, 2007; Phelan, et al., 2010), and also are less likely to smoke or to drink in excess (Konkolÿ Thege et al., 2009; Marsh, Smith, & Piek, 2003). As may be expected from this, prior work has documented a robust relationship between purpose in life and reduced mortality (Boyle et al., 2009; Cohen, Bavish, & Rozanski, 2016; Hill & Turiano, 2014).

Given this growing body of evidence, one might expect an equally strong relationship between purpose in life and biological health, such as inflammation or cardiovascular risk. Consistent with this expectation, prior work shows that high levels of purpose in life are associated with low levels of two of the most widely studied inflammatory biomarkers, interleukin-6 (IL-6; Ryff, Singer, & Love, 2004) and c-reactive protein (CRP; Friedman & Ryff, 2012) among Western populations. Having a purpose in life is also associated with an increase in HDL cholesterol in a population of elderly women in the United States (Ryff et al., 2004). However, it is not clear whether these salubrious effects of purpose in life generalize to a broader range of individuals, particularly those outside of Western cultures.

Does Culture Matter?

Prior work has amply demonstrated that Americans, particularly those of European descent, are more individualistic (Oyserman, Coon, & Kemmelmeier, 2002; Triandis, 1995), strongly endorse a view of the self as independent from others (Markus & Kitayama, 1991), and thus have a strong commitment to pursuing personal goals (Kitayama et al., 2006; Oishi & Diener, 2002). Their sense of happiness and "being well" is distinctly personal, linked closely to personal achievement (Uchida & Kitayama, 2008). In contrast, many cultures outside of the West

including those of East Asia, such as Japan, Korea, and China, are more collectivistic (Triandis, 1995). Individuals from these cultures strongly endorse a view of the self as interdependent with others (Markus & Kitayama, 1991), and thus have a strong commitment to pursuing social and communal goals (Kitayama et al., 2006; Oishi & Diener, 2002). Their sense of happiness and "being well" is far more social, grounded in social harmony and embeddedness (Uchida & Kitayama, 2008).

We hypothesized that the effect of purpose in life on biological health varies by culture, depending on the relative emphasis given to independence or interdependence. Many purposes one may have in life are related to goals and desires of the self, such as career advancement or achieving personal values and goals. A strong focus on personal goals, values, and ideals, induced by such purposes in life, is positively sanctioned in independent cultures since it is precisely the type of orientation to the world that is valued and prioritized in such cultures. While quality social relations and pro-social behaviors are also associated with purpose in life (Bowman et al., 2010; Pinquart, 2002), these social aspects of purpose may still be reinforced by the cultural emphasis on asserting the self, as developing a sense of purpose can be seen as achieving a personal goal and acquiring a unique attribute that sets the self apart. Finding one's purpose, whether it is relational or self-driven, is a way of asserting one's self and is often framed as a personal journey or achievement in Western cultures. The fact that purposeful orientations receive cultural endorsement and support in the West may be an important reason why purpose in life is linked strongly to various measures of health in the existent Western studies.

In contrast, in interdependent cultures, a much stronger value is placed on social harmony. Hence, the focus on personal goals and ideals that comes with some purposes in life may not be as appreciated or recognized in unequivocally positive terms as it is in Western, independent cultures. Indeed, in interdependent cultures such as Japan, a focus on personal goals and ideals may often be frowned upon, if not punished outright, since it is not prioritized over social harmony. This is not to say that all purpose is inherently self-oriented, but instead that within these cultural contexts, a strong commitment to one's purpose may be perceived as a focus on the self and one's own desires. Such a perception of purpose as being a personal focus may entail various social costs such as interpersonal conflicts, frictions, and disagreements. Therefore, in these contexts, people with strong purposes and commitment to their personal goals may be suspected to be selfish or egoistic, and as a consequence, they may have trouble maintaining culturally approved forms of social relations that emphasize social harmony and the lack of conflicts and tensions. Considering that disruption of close relationships is a serious health risk (Cacioppo et al., 2015; Coyne & DeLongis, 1986; Gore, 1978), the positive health effect of purpose in life, commonly observed in Western samples, could be more difficult to observe in Asian cultural contexts.

Gratitude As a Key Moderator

In the current work, we proposed that the potential social cost of purpose in life, albeit sizable in Asian cultural contexts, could still be surmountable. Any social frictions that a perceived personal focus of purpose in life might entail may be buffered or offset by the presence of socially-oriented virtues in such cultures. Such social virtues would highlight the value the person places on the ever-important interdependence of the self with others, affirming that the

person is mindful of others, appreciative of their concerns and interests, and willingly acknowledges important contributions others make to any success one may achieve. One virtue that may carry these interpersonal attributes that could mitigate the suspicion of egoism linked to purpose in life is gratitude.

Gratitude shared either from one person to another or mutually between persons helps form relationships between them, strengthens their social bonds, and promotes feelings of being socially integrated (Algoe, Fredrickson, & Gable, 2013; Algoe, Haidt, & Gable, 2008). It is also related to social support, a strong predictor of better health (August, Kelly, & Markey, 2016; Sun et al. 2014;). When one has received something positive from another person, they may feel grateful for the benefits. By showing gratitude, they express their willingness to reciprocate the favor and also signal that they value the relationship. When expressed, gratitude will strengthen the social bond. In both the United States and Japan, gratitude is associated with satisfaction with one's relationships (Robustelli & Whisman, 2016). Thus, we anticipated that purpose in life could have positive health outcomes even in interdependent cultural contexts where the potential social cost of purpose in life is likely more consequential, as long as this personal virtue is combined with the social virtue of gratitude. In other words, there would be a joint effect of purpose in life and gratitude such that those who simultaneously possess these two virtues would be most likely to enjoy positive health outcomes in such cultures. In contrast, we hypothesized that in Western, independent cultural contexts, purpose in life would entail positive health outcomes regardless of gratitude. These cultures promote the individual above the collective self, likely valuing pursuing purpose in life above maintaining social harmony, and thus, purpose may incur little or no social cost. While those in interdependent contexts may risk being seen as

egoistic or selfish pursuing an individualistic virtue such as purpose, those in independent contexts may be encouraged to do so.

Present Work

The primary goal of the current work was to test these predictions using two parallel surveys conducted in Japan and the U.S. Following our earlier studies (Kitayama et al., 2015; 2018; Park et al., 2019), we focused on four biomarkers, two each for inflammation (IL-6 and CRP) and cardiovascular malfunction (systolic blood pressure and the ratio of total-to-HDL cholesterol), to create a single index of biological health risk (BHR). We predicted that while purpose in life would be predictive of reduced BHR for Americans regardless of their levels of gratitude, purpose in life would predict decreases in BHR only for Japanese who were also high in gratitude.

In addition, there is an important question of whether gratitude by itself might have a salubrious effect. As noted above, available evidence shows that in both the United States and Japan, gratitude is associated with satisfaction with one's relationships (Robustelli & Whisman, 2016). However, it is not clear whether this association could be extended to biological health. To the extent that gratitude is more valued in Japan than the United States, as is likely given the link between gratitude and social bonds as well as how social harmony is valued in Japan, the inverse association between gratitude and BHR could be more pronounced in Japan than in the United States.

Method

Participants

The American data were drawn from the Midlife in the United States (MIDUS) survey. The initial MIDUS survey was conducted in 1995 with a sample of 7,108 participants recruited from across the United States using random digit dialing. The majority (n = 4,963) participated in a follow-up survey, MIDUS II, in 2004. A subset of MIDUS II participants (n = 1,054, 578 females, M_{age} = 58.04) participated in an additional overnight session at a clinical research center where biomarker data were collected. The biomarker sample of MIDUS II participants was multi-racial (976 European Americans, 32 African Americans, 6 Native Americans, 5 Asian Americans, 1 multi-racial, 30 others, and 4 missing), but the present analysis focused on European Americans (n = 976, 531 females, M_{age} = 58.36) (see Kitayama et al., 2018 and Park, Kitayama, Miyamoto & Coe, 2019 for the same approach). European Americans are more independent than ethnic minorities in the U.S. (Oyserman, Coon, & Kemmelmeier, 2002), and focusing on this sample allows for a stronger cultural contrast against Japanese, who are more interdependent (Kitayama, Park, Sevincer, Karasawa, & Uskul, 2009). Japanese participants were from the Midlife in Japan (MIDJA) survey. The MIDJA was conducted in 2008 with 1,027 participants randomly recruited from the Tokyo metropolitan area. The sample in the present study is a subset of participants (n = 382, 214 females, M_{age} = 55.47) who participated in an additional session at a clinical research center where biomarker data was collected.

Measures

Biological health risk. BHR was assessed using biomarkers of inflammation (IL-6 and CRP) and cardiovascular risk (cholesterol and blood pressure).

IL-6 is an inflammatory cytokine whose presence indicates an immune response and bodily stress (Ishihara & Hirano, 2002). CRP is a protein found in blood plasma that increases in

response to inflammation (Pepys & Hirschfield, 2003). The blood samples were frozen and shipped to Biocore Laboratory (Madison, WI) for the assays. Levels of IL-6 were measured using a high-sensitivity enzyme-linked immunosorbent assay (ELISA; Quantikine, R&D Systems, Minneapolis, MN) with a lower sensitivity of detection of 0.16 pg/mL. CRP levels were assessed using BNII immunoephelometry (BNII Nephelometer 100 Analyzer; Dade Behring Inc., Deerfield, IL).

Cardiovascular risk was assessed with cholesterol and blood pressure levels. Risk with respect to cholesterol was indexed by the ratio of total cholesterol to HDL cholesterol. HDL is the "good" form of cholesterol (Toth, 2005) and thus a higher ratio reflects having more of the unhealthy cholesterol than the beneficial form. The blood samples were frozen and shipped to Meriter Labs (Madison, WI) and Showa Medical Science (Tokyo) in the United States and Japan, respectively, and were assayed using a Cobas Integra analyzer (Roche Diagnostics, Indianapolis, IN). Participants' blood pressure was assessed three times with 30-second rest periods between recordings, and the two recordings with the most similar scores were averaged to develop participants' systolic blood pressure (SBP) value.

For both cultures, extreme values for each of the four biomarkers were winsorized at ±3 standard deviations from the mean, following prior research (Park et al., 2019). All four biomarkers were log-transformed in order to reduce skewness. Kitayama et al. (2015; 2018) and Park et al. (2019) found that all four biomarkers loaded onto a single factor for both cultures. We thus used a factor score from a principle component analysis performed on the data from the two cultures combined as an index of BHR.

Purpose in life. Purpose in life was assessed using the 7-item purpose in life subscale of the psychological well-being scale (Ryff, 1989; Ryff & Keyes, 1995; Appendix A). In addition to purpose in life, this scale also measured the remaining five subscales of psychological well-being, including personal growth, environmental mastery, autonomy, self-acceptance, and positive relations with others, with 7 items each. Participants rated the degree to which they agreed that each statement described them on a 1 (*strongly disagree*) to 6 (*strongly agree*) rating-scale, with some items reverse-coded (e.g., "I don't have a good sense of what it is I'm trying to accomplish in life" [reverse-coded]; αs = .71 and .69 for European Americans and Japanese, respectively). In addition to purpose in life, we also assessed personal growth (αs = .75 and .71), environmental mastery (αs = .80 and .71), autonomy (αs = .69 and .71), self-acceptance (αs = .84 and .82), and positive relations with others (αs = .78 and .79), in order to examine whether the hypothesized moderating role of gratitude is specific to purpose in life or extends to other facets of psychological well-being.

Gratitude. Dispositional gratitude was measured using a scale adapted from McCullough, Emmons, & Tsang (2002). Participants rated their agreement with two statements, "I am grateful to a wide variety of people" and "I have so much in life to be thankful for" on a scale of 1 (*strongly disagree*) to 7 (*strongly agree*), assessing (a) thankfulness for others and (b) a general sense of appreciation for life, respectively. These values were summed to create a single index of gratitude scores (αs = .98 and .91 for European Americans and Japanese, respectively).

Control variables. We followed our earlier work (Miyamoto et al., 2013; Kitayama et al., 2015, 2018) and controlled for a set of variables that would potentially confound the relationships between purpose in life and BHR, including demographic variables (sex, age,

educational attainment), health behaviors (smoking status and alcohol consumption), and health status of participants (body-mass-index [BMI], chronic conditions, and medication usage). Sex, age, and education were controlled for because previous research indicates that rates of cardiac arrest vary depending on age and sex (Lloyd-Jones et al., 2009), older adults often report lower purpose than middle aged adults (Ryff, & Singer, 1998), and educational attainment is correlated with health outcomes (Marmot, 2007). BMI was controlled for due to weight's relationship with inflammation (Wang, & Nakayama, 2010). Because chronic illness likely impacts the chosen biomarkers, the number of diagnoses of chronic conditions (e.g., diabetes) participants reported was used to create a score for co-morbidity with illness.

Demographic. Samples for both cultures were over 50% female (54.5% for European Americans, 56.0% for Japanese). The mean ages at the time of the biomarker assessment were 58.38 and 55.47 for European Americans and Japanese, respectively. The highest level of education participants attained was used to create an education score, but because the two cultures have a different educational system, educational attainment was originally recorded on a culturally-specific scale. In the U.S., this scale ranged from 1 (*8th grade*) to 12 (*Ph.D. or other professional degree*) and in Japan, the scale ranged from 1 (*junior high school graduate*) to 8 (*graduate school*). In order to compare the two cultures, the scores were re-coded into a single scale ranging from 1 (*junior high*) to 7 (*graduate school*), following the procedure outlined in Park et al. (2013).

Health behaviors. Smoking and alcohol use affect the chosen biomarkers of cardiovascular health (De Oliveira e Silva et al., 2000; Bermudez et al., 2002), and thus were controlled for. Participants' smoking status (current, former, or never) was recorded as a binary

response (0 = *no*, 1 = *yes*), and used to create two smoking indices: current and former smokers coded against never smokers, respectively. Participants were asked the number of alcoholic drinks they consumed each week, which served as an index of alcohol consumption. There were a number of outliers for alcohol consumption (n = 26), and the outlier scores were winsorized at ±3 standard deviations from the mean for their respective cultures.

Health status. BMI was calculated using height and weight measurements recorded in the clinic (kg2/m), and the values were log-transformed in order to adjust for skewness. Additionally, the number of chronic conditions participants reported was used to create a score for co-morbidity with illness (Appendix B). This score was capped at 5 in order to normalize the distribution, following procedure by Turiano et al. (2013).

Analytic Strategies

Our primary focus was to test the effects of purpose in life on BHR, given past research on the relationship between purpose and inflammatory markers. Specifically, we examined whether the relationship between purpose in life and BHR is moderated by both gratitude and culture. Following previous work (Kitayama et al., 2015; 2018), we tested our predictions in four regression models. All models included main effects of purpose in life, gratitude, and culture, three 2-way interactions between the variables (Purpose x Gratitude, Purpose x Culture, Gratitude x Culture) and one 3-way interaction (Purpose x Gratitude x Culture). The models varied, however, in the set of control variables included. In Model 1, we included no control variables. In Model 2, we additionally included demographic variables (sex, age, and level of educational attainment) as control variables. In Model 3, we added two measures of health behaviors (alcohol consumption and smoking status). In Model 4, we additionally included two

measures of health status (BMI and chronic conditions).

Results

Descriptive Statistics

Descriptive statistics for the key study variables are reported in Table 1. Table 2 shows correlations among the key variables, including the individual factors comprising BHR (i.e. IL-6, CRP, SBP, and total-to-HDL cholesterol ratio). In both cultures, all four factors comprising BHR were correlated with one another. Additionally, gratitude and purpose in life were positively correlated in both cultures. Of note is that purpose in life but not gratitude was negatively correlated with BHR in European Americans. The reverse was true among Japanese: gratitude was negatively correlated with BHR, but purpose in life was not.

Regression predicting BHR

The results of the regression models are summarized in Table 3. Across the models, several effects proved reliable. First, the main effect of culture was highly significant in all models. BHR was substantially lower for Japanese than for Americans. Second, the effect of purpose in life tends to be significant. The purpose in life main effect was significant in Models 1-3, although it was attenuated in Model 4, where health indices of BMI and comorbidity with disease were added as additional covariates. Third, the interaction between gratitude and culture was reliable in all models. Importantly, this interaction tended to be further qualified by a 3-way interaction involving purpose in life. This interaction was significant in Model 3, and close to statistical significance in Models 2 and 4. We thus proceeded to assess the nature of the 3-way interaction by testing the theoretically crucial 2-way interaction between purpose in life and gratitude in each of the two countries within the same four regression models.

There were no main effects of purpose in life among Japanese participants in any of the models. As might be predicted by a greater cultural value places on social virtues, the main effect of gratitude was consistently significant among Japanese in Models 1-3, b = .-17, $t(336) = -2.89$, $p < .01$ (Model 3), though it became marginal when additionally controlling for health status in Model 4, $b = -.10$, $t(334) = -1.80$, $p = .07$. As summarized in Table 4, the Purpose x Gratitude interaction was significant in Models 2-4 for Japanese, $b = -.02$, $t(339) = -2.48$, $p < .05$, $b = -.02$, $t(336) = -2.97$, $p < .01$, and $b = -.01$, $t(334) = -2.20$, $p < .05$, respectively. Using Model 3, the pattern is illustrated in Figure 1. As can be seen, BHR was significantly reduced as a function of purpose in life for those who scored 1 *SD* higher than the mean in gratitude, $b = -.02$, $t(338) = -2.01$, $p < .05$.

In contrast, for European Americans, there was a significant main effect of purpose in life in Models 1 & 2, $b = -.01$, $t(952) = -2.23$, $p < .05$, and $b = -.01$, $t(949) = -2.12$, $p < .05$, respectively (Table 5). This effect became marginal in Model 3, $b = -.01$, $t(946) = -1.96$, $p = .05$ and statistically insignificant in Model 4 $b = < -.01$, $t(944) = -.95$, $p = .34$. There were no main effects of gratitude in any of the models for European Americans. Further, there were no significant Purpose x Gratitude interactions for European Americans.

Looking at the data from a different angle, it is evident that the effect of gratitude was reliable among Japanese, where it was associated with reduced BHR. This effect was most apparent among those who were high in purpose in life. However, it was significant even when purpose in life was collapsed. In contrast, there was no effect of gratitude among European Americans. This pattern resulted in a significant interaction between gratitude and culture.

Discussion

We hypothesized that, in interdependent societies like Japan, having a strong purpose in life could potentially invite suspicion of egoism, unless the person is also recognized as appreciative of social relationships in which he or she is embedded. We thus examined the possibility that in such cultures, purpose in life would be salubrious only when it is combined with certain social virtues that affirm the person as deeply committed to the relationship. In support of this reasoning, we found a significant interaction between purpose in life and gratitude on BHR among Japanese. In contrast, purpose in life was linked to reduced BHR regardless of the level of gratitude among European Americans. In independent societies such as the United States, having a strong sense of purpose in life is culturally sanctioned in clear and explicit terms, as it underscores the quality of the person as independent, autonomous, and thus living up to the ultimate criterion for being good and virtuous. This association between purpose in life and biological health risk among Americans corresponds with prior research on the association between purpose in life and inflammation (Friedman & Ryff, 2012; Ryff, Singer, & Love, 2004). It is of note that, among European Americans, the salubrious effect of purpose in life on BHR was no longer significant once two measures of health status, BMI and number of chronic conditions, were controlled for. While there were main effects of both of these measures of health status on BHR, there were no interactions between either measure of health status and purpose in life.

Just as important, in support of the notion that social virtues such as gratitude are valued unequivocally in Japan, gratitude predicted lower BHR among Japanese. It may be suggested that various facets of gratitude, including an appreciation of others' help, acknowledgment of it, and the desire to thank and return the goodwill, may be central to the ethos of interdependence as

realized in Japanese culture. People high in gratitude may be socially accepted and rewarded. The accepting social relations that ensue may relieve any social stress and thereby reduce pro-inflammatory reactions (Cacioppo et al., 2015; Cole, 2009). In stark contrast, the effect of gratitude was absent among European Americans. Given this pattern, we wonder if gratitude might be ambivalent, inviting some degree of suspicion, in contemporary American. culture. This suspicion may be analogous to the one purpose in life might receive in Japanese context. Given the Japanese emphasis on interdependence, while purpose may be appreciated as a virtue, it may sometimes be suspected as a form of egoism in disguise. Likewise, given the American emphasis on independence, while gratitude may be appreciated as a virtue, it may also be sometimes suspected as a form of dependence on others in disguise. The dependence on others is directly antagonistic to the cultural ideal of independence and, thus, may be despised and regarded as "free-riding." Hence, as much as gratitude is considered as a virtue, it may also be seen as a reflection of something very different that is in direct conflict with the central cultural mandate of independence. The resulting ambivalence may offset any health benefits gratitude might have otherwise entailed. Future work must test this conjecture.

One prior Japanese study showed a salubrious effect of *ikigai*, a Japanese concept akin to purpose in life. Sone and colleagues (2008) tested ikigai (literally meaning "what makes life worth living") and found that middle-aged Japanese with ikigai tended to live longer. At a 7-year follow-up, only 5% who had reported having ikigai at baseline died, compared with a 17% of morality rate for those who had reported having no ikigai, controlling for lifestyle habits such as smoking as well as history of chronic diseases. This effect was reliable for all-cause mortality, but particularly pronounced for death from cardiovascular diseases, consistent with a wider range

of studies reviewed by Cohen et al. (2016). Given the equation (ikigai = purpose in life), the Sone et al. evidence might seem to contradict our thesis that the positive health effect of purpose in life requires certain social virtues including gratitude in Japanese cultures. However, ikigai literally means "what makes life worth living" and as such is likely to encompass both purposes one can hold for self-advancement and achievement and other virtues and values that are more social in nature. For example, raising one's child or even merely watching the child grow could be one's ikigai. Likewise, it could also give one an ikigai when they participate in community events or take leadership roles in these events. It is possible that this broad scope encompassed in this construct, ikigai, may make it possible to achieve positive health outcomes in a culture that would otherwise be lukewarm at best and potentially even antagonistic when people actively pursued personal goals and desires. Future research is necessary to test whether personal vs. social forms of ikigai may result in different health consequences among Japanese.

Some limitations of the present work must be acknowledged. First, the measurement of socio-cultural variables in the current work depended entirely on a set of self-report survey items. Future work must use different methods to assess purpose and gratitude. For example, the current analysis could be tested using participants' free-response descriptions of what precisely they see as their purpose in life. Second, our work focused exclusively on biological health risk. Future work must assess alternative measures of health including mortality and morbidity. Third, our work was limited to only two countries. It would be quite informative to test whether the pattern observed in Japan might be generalizable to other Asian countries or, for that matter, to countries in other regions that value interdependence and social harmony equally strongly. Despite these limitations, the current work makes an important contribution to the literature by

showing that what appears to be unequivocally good and valuable (purpose in life) in one cultural context could be more ambivalent in another, and such ambivalence has consequences for biological health. Future work along this line carries great potential to extend the horizon of the research on health and well-being.

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Table 1. *Descriptive statistics for variables of interest, comparing participants in the United States and Japan*

	Japanese			European Americans		
	N	M	SD	N	M	SD
Variable						
BHR	382	-0.78	0.96	962	0.29	0.85
IL-6	382	0.04	0.36	968	0.32	0.32
CRP	382	-0.45	0.42	965	0.41	0.50
SBP	382	2.08	0.07	975	2.11	0.06
Ratio cholesterol	382	0.47	0.14	967	0.55	0.15
Gratitude	379	5.61	1.11	975	6.29	0.81
Purpose in life	382	32.30	5.29	975	39.63	6.50
Demographics						
Sex (% female)	382	56.00		976	54.50	
Age	382	55.47	14.04	976	58.36	11.69
Education	378	4.38	1.63	972	5.00	1.60
Health Behaviors						
Smoking- current	82	21.50%		99	10.10%	
Smoking- former	89	23.30%		318	32.60%	
Alcohol use	379	6.96	9.66	974	3.02	4.79
Health Status						
Log BMI	382	1.35	0.06	975	1.46	0.08
Comorbidity	378	1.06	1.24	976	2.29	1.66

Note. Ratio cholesterol refers to the ratio of total-to-HDL cholesterol. Values for all components of BHR are log-transformed, as is BMI. Smoking status was assessed using contrasts of current vs. never smokers and former vs. never smokers. Values listed for alcohol consumption reflect the raw data, pre-winsorization.

Table 2. *Correlation coefficients between BHR and psychological variables for European Americans (A) and Japanese (B)*

A. European Americans	1	2	3	4	5	6	7
1. BHR	*						
2. IL-6	.74*	*					
3. CRP	.77*	.50*	*				
4. SBP	.49*	.13*	.14*	*			
5. Ratio Chol.	.50*	.11*	.18*	.12*	*		
6. Purpose in life	-.08*	-.07*	-.02	-.01	-.15*	*	
7. Gratitude	-.03	.01	< -.01	.020	-.11*	.34*	*

B. Japanese	1	2	3	4	5	6	7
1. BHR	*						
2. IL-6	.81*	*					
3. CRP	.73*	.50*	*				
4. SBP	.69*	.38*	.27*	*			
5. Ratio Chol.	.59*	.25*	.28*	.32*	*		
6. Purpose in life	-.09	-.06	-.07	-.06	-.06	*	
7. Gratitude	-.10*	-.10	-.06	-.10	-.03	.32*	*

Note. All values used to comprise the score of BHR are correlated with one another, thus they were combined into the singe factor. Ratio cholesterol refers to the ratio of total-to-HDL cholesterol.

Table 3. *Regression coefficients predicting BHR as a function of purpose in life, gratitude, and culture*

Biological Health Risk	Model 1			Model 2			Model 3			Model 4		
	b	se	p	b	se	p	b	se	p	b	se	p
Purpose in life (P)	-0.01	0.01	0.03	-0.01	<.01	0.02	-0.01	<.01	0.04	< -.01	<.01	0.33
Gratitude (G)	-0.01	0.04	0.85	0.01	0.04	0.73	0.02	0.04	0.58	0.02	0.03	0.48
Culture (C)	-1.20	0.07	<.01	-1.13	0.07	<.01	-1.15	0.07	<.01	-0.55	0.07	<.01
P x G	< -.01	<.01	0.55	< -.01	<.01	0.74	< -.01	<.01	0.74	< -.01	<.01	0.84
P x C	< -.01	0.01	0.74	<.01	0.01	0.81	<.01	0.01	0.87	-0.01	0.01	0.51
G x C	-0.18	0.07	0.02	-0.18	0.07	0.01	-0.20	0.07	<.01	-0.13	0.06	0.04
P x G x C	-0.01	0.01	0.13	-0.01	0.01	0.08	-0.02	0.01	0.04	-0.01	0.01	0.09
Sex				-0.3	0.05	<.01	-0.28	0.05	<.01	-0.16	0.04	<.01
Age				0.02	<.01	<.01	0.02	<.01	<.01	0.02	<.01	<.01
Education				-0.07	0.02	<.01	-0.06	0.02	<.01	-0.04	0.01	<.01
Alcohol consumption							<.01	<.01	0.66	<.01	<.01	0.27
Former smoker							0.01	0.05	0.91	-0.03	0.05	0.52
Current smoker							0.26	0.07	<.01	0.24	0.06	<.01
BMI										5.36	0.26	<.01
Comorbidity w/ disease										0.03	0.01	0.04

Note. N for Japanese sample = 329, *N* for European American sample = 956

Table 4. *Regression coefficients predicting BHR as a function of purpose in life and gratitude for Japanese participants*

Biological Health Risk	Model 1			Model 2			Model 3			Model 4		
	b	se	p	b	se	p	b	se	p	b	se	p
Purpose in life (P)	-0.01	0.01	0.21	-0.01	0.01	0.41	-0.01	0.01	0.38	-0.01	0.01	0.23
Gratitude (G)	-0.18	0.07	0.01	-0.15	0.06	0.01	-0.17	0.06	<.01	-0.10	0.06	0.07
P x G	-0.02	0.01	0.05	-0.02	0.01	0.01	-0.02	0.01	<.01	-0.01	0.01	0.03
Sex				-0.70	0.09	<.01	-0.57	0.10	<.01	-0.38	0.09	<.01
Age				0.03	<.01	<.01	0.03	<.01	<.01	0.03	<.01	<.01
Education				-0.05	0.03	0.09	-0.04	0.03	0.19	-0.04	0.03	0.14
Alcohol consumption							0.01	0.01	0.07	0.01	<.01	0.07
Former smoker							-0.02	0.11	0.85	-0.04	0.10	0.68
Current smoker							0.30	0.11	0.01	0.23	0.10	0.03
BMI										5.77	0.72	<.01
Comorbidity w/ disease										0.01	0.03	0.72

Note. N for Japanese sample = 345

Table 5. *Regression coefficients predicting BHR as a function of purpose in life and gratitude for European American participants*

Biological Health Risk	Model 1			Model 2			Model 3			Model 4		
	b	se	p	b	se	p	b	se	p	b	se	p
Purpose in life (P)	-0.01	<.01	0.03	-0.01	<.01	0.03	-0.01	<.01	0.05	< -.01	<.01	0.34
Gratitude (G)	-0.01	0.04	0.85	0.01	0.04	0.89	0.01	0.04	0.90	0.01	0.03	0.69
P x G	< -.01	<.01	0.54	< -.01	<.01	0.69	< -.01	<.01	0.64	< -.01	<.01	0.72
Sex				-0.15	0.05	<.01	-0.18	0.06	<.01	-0.09	0.05	0.06
Age				0.01	<.01	<.01	0.01	<.01	<.01	0.01	<.01	<.01
Education				-0.07	0.02	<.01	-0.06	0.02	<.01	-0.04	0.01	<.01
Alcohol consumption							-0.02	0.01	0.01	-0.01	0.01	0.10
Former smoker							0.04	0.06	0.52	-0.01	0.05	0.89
Current smoker							0.15	0.09	0.10	0.20	0.08	0.01
BMI										5.07	0.28	<.01
Comorbidity w/ disease										0.04	0.02	0.01

Note. $N = 955$

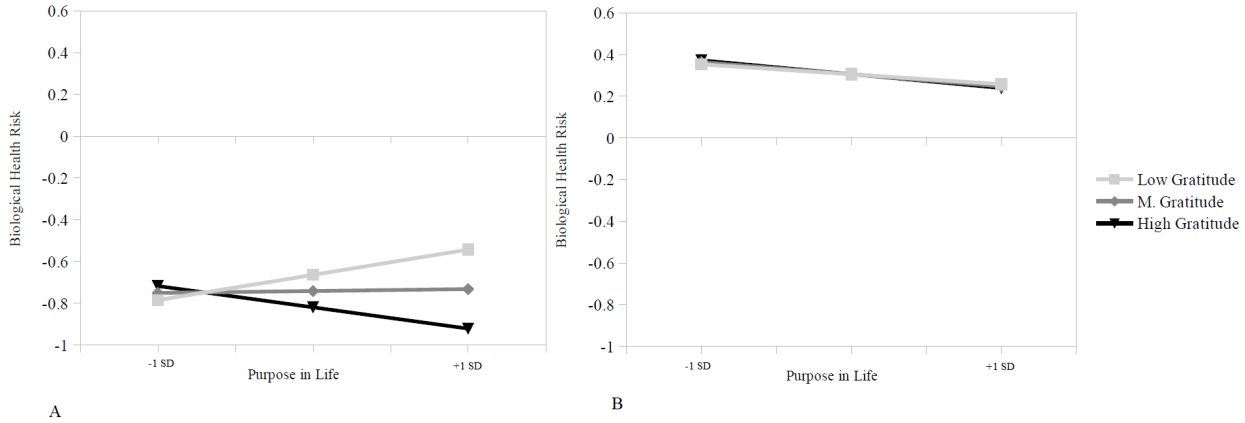

Figure 1. The relationship between purpose in life and BHR as a function of gratitude for Japanese (A) and European Americans (B). Among Japanese participants, there was a significant Purpose x Gratitude interaction in which increased purpose was associated with decreased biological health risk among those high in gratitude.

Chapter 3

Biological Health Risk and Self-Rated Health Among Sexual Assault Victims

Sexual assault is more prevalent than may be commonly realized. Among the general population, roughly 20% of females and 4% of males have experienced assault, and this prevalence rate is even higher among certain populations, such as the military and prison populations (Elliott, Mok, & Briere, 2004; Sadler et al., 2004; Cloutier, Martin, & Poole 2002; Skinner et al., 2000; Struckman-Johnson & Struckman-Johnson, 2000; Browne, Miller, & Maguin, 1999). Much of the research on sexual assault prevalence focuses on specific populations, such as college students or military members, often concentrating on how to lower the prevalence rate among those populations or how to increase access to resources for recovery (Rothman & Silverman, 2007; Feldhaus, Houry, & Kaminsky, 2000). There remains a need for further research regarding outcomes of assault among the general population. The present research focuses on the general population, assessing health outcomes, both subjective and biological, among a sample of adults in the United States.

Research on assault outcomes largely examines clinical psychological outcomes, such as assessing victims' experience of PTSD symptoms (Ullman, Najdowski, & Filipas, 2009). Such research on the outcomes of assault is often focused solely on the population of victims themselves, rather than drawing comparisons between the victim population and the general population. For example, McFarlane et al. (2005) assessed rates of substance abuse among adult women seeking resources following a sexual assault. They found that the amount of assaults a

woman was subjected to was linked with her likelihood of developing substance abuse, however, they did not assess whether women who have experienced an assault were more likely to develop substance abuse than a control population. While there is research that compares women who have experienced assault to those who have not, such research is often focused on behavioral or mental health outcomes, such as depression, alcohol use, or suicidality. For example, Behnken et al. (2010) observed that adolescent females who had been sexually assaulted were more likely to binge drink and were at higher risk for suicidality than their peers who had not experienced such an assault. Although such research is valuable, there is further need to assess the physical health of victims compared with non-victims. There is previous research on the relationship between sexual assault and health outcomes, such as research that has noted that victims have higher rates of obesity (Cloutier, Martin, & Poole, 2002), but there is a need to assess the biological health of victims. These broad health differences, such as obesity, may be reflected in differences in biological health between victims and non-victims, such as grater inflammation or poorer cardiovascular health among victims. Of interest is how sexual assault victims differ from those who have never been victimized with respect to a number of psychological and health factors (both self-reported and biological), as well as how those factors relate with one another.

The present research seeks to address the need for assessments of the potential biological health outcomes alongside self-reported health and psychological outcomes of sexual assault, comparing victims of assault with those who have never experienced assault. More specifically, of interest is how both groups fare with respect to biological health risk, self-reported health, eudaimonic well-being, and personality traits such as neuroticism. Further, it examines the

relationships between these factors, as well as factors that influence health for victims themselves.

Health factors

Biological health. The experience of sexual assault may be a risk factor for poorer biological health outcomes such as inflammation and high body mass index (BMI). The impact of assault on mental health has been proposed as a mechanism through which this may occur (Kendall-Tackett, 2007). Women who have been sexually assaulted have higher rates of depression (Burnam, 1988), and depression has been linked with inflammation (Raison, Capuron, & Miller, 2006). Further, sexual assault is a risk factor for developing PTSD (Surís et al., 2004), and symptoms of PTSD have also been associated with inflammation (Heath et al., 2013). This link between mental distress and biological health suggests that those who have been sexually assaulted may have poorer biological health than their peers. Additionally, women who have been sexually assaulted self-report poorer health and report more somatic symptoms such as pain than others (Golding, 1994). However, such reported symptoms may not necessarily be due to an organic source or be reflected in biomarkers measuring biological health. Previous research has noted that self-reported health and biological health are not necessarily related to the same factors. Miyamoto et al. (2013) found that although negative emotions predicted poorer self-rated health in both Japanese and Americans, negative emotions only predicted biological health among Americans. There may be sub-populations within the United States, such as assault victims, for whom the relationship between self-reported and biological health is nuanced. In order to fully assess the relationship between sexual assault history and health, both biological and self-reported health must be examined together.

Self-reported health. It is likely that those who have been sexually assaulted report a higher overall number of chronic conditions than their peers, whether or not those conditions have an identifiable organic cause. Previous research has shown an association between sexual assault and self-reports of conditions such as pelvic pain or gastrointestinal complaints (Walker et al., 1992; Drossman et at., 1995). However, this research focuses on outcomes linked with childhood abuse, and also groups multiple forms of abuse (sexual, physical) together into a single risk-factor. This leaves a need to investigate the relationship between lifetime incidence of sexual assault and the experience of chronic conditions. Further, previous research suggests that there is an association between overall subjective ratings of one's health and sexual assault. A history of sexual assault has been associated with poor subjective ratings of health among women, independent of depression (Golding, Cooper, & George, 1997). In addition to the need to measure whether self-rated health aligns with objective measures of health among victims, there needs to be an examination of what can account for any observed poor self-reported health. Because depression cannot account for a relationship between assault history and self-reported health, research must examine if it can be accounted for by other psychological factors, such as eudaimonic well-being or personality, specifically neuroticism. The present research focuses on eudaimonic well-being and neuroticism as such potential factors. In addition to comparing those who have and have not been assaulted, the present research also examines victims themselves. It measures whether victims' perceptions of how negative (or positive) of a long-term effect that the assault had on their life may link with these psychological factors, which in turn may be associated with self-reported health.

Psychological factors

Eudaimonic well-being. Eudaimonic well-being has been described as a reflection of one's functioning in life, encompassing one's ability to have meaning in life and ability to be self-actualized (Keyes & Annas, 2009). It relates to whether one finds their life meaningful, rather than addressing emotions one feels towards their life (Ryan & Deci, 2001).

Eudaimonic well-being has been associated with positive health outcomes such as longevity and lower rates of heart attack or stroke (Hill & Turiano, 2014; Kim et al., 2013; Kim, Sun, Park, & Peterson, 2013). This connection with health outcomes may be reflected in self-rated measures of health, such as one's reported number of chronic conditions or subjective ratings of their own health. It is likely that those who have experienced sexual assault have lower eudaimonic well-being than their peers, due to such an assault likely impacting psychological factors such as one's sense of autonomy. A difference in eudaimonic well-being may help account for any health differences found between those who have and have not been assaulted. The relationship between the long-term effects of assault and health may be partially mediated by well-being, driving group differences.

Neuroticism. Previous research on sexual assault and personality has largely focused on the personality factors of perpetrators (Voller & Long, 2010; Mouilso & Calhoun, 2012). However, those who have experienced the trauma of assault may have differing personality factors than others, whether that means certain personality factors are risk-factors for being targets of abuse, or that traumatic experiences can alter what is normally seen as a stable factor. Specifically, victims of abuse may have higher neuroticism, given that neuroticism is associated with depression and victims of sexual assault have higher rates of mental disorders such as depression (Saklofske, Kelly, & Janzen, 1995; Burnam, 1988). If such a difference between

groups exists, a causal claim cannot be made with respect to whether the trauma of the event lead to increased neuroticism or whether increased neuroticism is a risk factor for assault.

While there is mixed evidence on whether neuroticism is linked with poorer biological health (Lahey, 2009; Turiano, Mroczek, Moynihan, & Chapman, 2013; Kitayama et al., 2018), it is associated with complaints of somatic symptoms (Costa & McCrae, 1987; Goubert, Crombez, & Van Damme, 2004). Those who are higher in neuroticism are more vigilant to pain because they are continually scanning the environment (both external and internal), and they also have a lower threshold for perceiving pain as threatening (Goubert, Crombez, & Van Damme, 2004). Due to the association between neuroticism and somatic complaints, those higher in neuroticism may have more negative perceptions of their health. A connection between neuroticism and perceptions of one's health may partially explain any relationship between sexual assault history and subjective measures of health. In addition to potential group differences based on assault history, there may be differences among victims themselves. Specifically, those who perceive their assault to have had a greater long-term negative effect on their life may exhibit greater neuroticism. Individuals higher in neuroticism may have more difficulty in "moving on" from a traumatic experience and thus rate the traumatic experience as having a greater long-term effect on their life. However, it is also possible that long-term effects of a traumatic experience could influence personality factors and lead to greater neuroticism. In turn, this potential greater sense of neuroticism may be associated with poorer perceptions of one's own health. Thus, regardless of whether or not there is a correlation between long-term effects of assault and health, those who have been assaulted and view that assault as having a lasting damaging effect on their life may have poorer perceptions of their own health, in part due to being higher in neuroticism.

Present Work

The current research assessed differences in biological and self-reported health, as well as psychological factors, between those who have been sexually assaulted compared with those who have not. It tested whether those who have been assaulted fare worse on all of these factors. While victims were expected to have poorer self-rated health due to prior evidence, there is no current evidence that this finding extends to their biological health as well. In this study, victims were predicted to also have poorer biological health.

Further, the present work examined these potential groups differences by assessing whether any observed health differences can be accounted for in part by psychological factors, eudaimonic well-being and neuroticism. Of interest is both assessing what group differences exist, as well as whether any observed health differences between groups are due to psychological differences. In addition to these group comparisons, the present work also aimed to investigate the relationship between psychological and health factors among victims themselves. It is possible that the trauma of assault is associated with poor biological health among victims. However, it is also possible that the psychological impacts of trauma lead victims to have a negatively biased schema of their self-perception, and thus they may perceive their health to be more poor than it actually is. A victim with a lower sense of eudaimonic well-being or higher in neuroticism may have a greater bias, and thus they may be more likely to report poor self-reported health despite not having poor biological health. A similar effect may be seen with respect to low well-being. Additionally, the present work tests whether victims' self-report of how negative (or positive) a long-term effect that the assault had on their lives is associated with their health. Measuring these potential group differences and within-group

differences will further the understanding of how those who have been sexually assaulted fare differently than their peers.

Method

Participants

Participants were those from the Midlife in the United States (MIDUS) survey who both reported whether or not they had experienced sexual assault in their lifetime and for whom there was biomarker data.

In 1995, the initial phase of the MIDUS (MIDUS I) was conducted using 7,108 participants recruited from across the country using random digit dialing. In 2004, 4,693 participants from the MIDUS I also participated in a follow-up survey, the MIDUS II. Of those who participated in the MIDUS II, a subset (n = 1,054, 578 females, M_{age} = 58.04) participated in an additional wave of data collection in which their biomarker data was collected during an overnight session at a clinical research center.

The current research focuses on those from the biomarker sample of MIDUS II who responded to a survey item indicating whether or not they have experienced sexual assault within their lifetime (n = 735). Of the respondents, 126 (17.2%, M_{age} = 54.10) reported having experienced sexual assault, and 609 (82.86%, Mage = 60.02) reported no experience of assault. Ultimately, 6.27% of all male participants and 26.12% of all female participants reported experiencing sexual assault. Overall, the victim population was 83.3% female. The sample was multi-racial, albeit mostly European American (690 European American, 18 African American, 2 Native American, 3 Asian American, 20 others, and 2 missing).

Measures

Health. Participants' health was measured using both biological and self-report measures.

***Biological health risk*.** Biological health risk (BHR) was assessed using four biomarkers measuring inflammation and cardiovascular risk.

Inflammation was measured using two biomarkers: Interleukin 6 (IL-6) and c-reactive protein (CRP). The presence of IL-6 in the blood indicates an immune response (Ishihara & Hirano, 2002), and the presence of CRP in plasma also indicates inflammation (Pepys & Hirschfield, 2003). Participants' blood samples were frozen and then shipped to Biocore Laboratory (Madison, WI), where they were assayed.

Cardiovascular risk was also assessed with two biomarkers, systolic blood pressure and the ratio of HDL to total cholesterol. Systolic blood pressure assessments for each participant were obtained by averaging the two most similar scores out of three measurements. The ratio of HDL to total cholesterol was measured using blood samples sent to Meriter Labs (Madison, WI) and assayed using a Cobas Integra analyzer (Roche Diagnostics, Indianapolis, IN).

Following the procedure of Kitayama et al. (2015; 2018), values for the four biomarkers were winsorized at ±3 standard deviations from the mean and then log-transformed. The four biomarkers load onto a single factor, and are thus combined as an index of BHR.

BMI. Participants' BMI was recorded in the clinic and was calculated using height and weight measurements (kg2/m). The values obtained were log-transformed in order to adjust for skewness.

Self-reported health. Self-rated health was measured using participants' response to the question "How would you rate your health these days?" on a 0 (*worst*) to 10 (*best*) scale.

Number of chronic conditions. Participants' number of chronic conditions was assessed using a checklist of 30 conditions (e.g. migraine headaches, diabetes). Participants were asked the question "In the past twelve months, have you experienced or been treated for any of the following?", and asked to check all that apply (Appendix B).

Eudaimonic well-being. Eudaimonic well-being was assessed using the Psychological Well-being Scale (Ryff, 1989; Ryff & Keyes, 1995; Appendix A), which measures 6 factors of well-being: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. Each factor is measured using a 7 item subscale, for which participants rated items such as "I have not experienced many warm and trusting relationships with others" on a 1 (*strongly agree*) to 7 (*strongly disagree*) scale. Although a response of 7 indicates strong disagreement, the questions are phrased such that a higher value indicates a higher amount of well-being. For the analysis, the scores for all factors of psychological well-being (PWB) were combined in order to form an overall psychological well-being score.

Neuroticism. Neuroticism was assessed using a scale developed for MIDUS in order to measure the Big 5 personality traits (Lachman & Weaver, 1997). Participants were asked to rate how much four adjectives (moody, worrying, nervous, calm [reverse coded]) described them on a 1 (*not at all*) to 4 (*a lot*) scale. The mean score was used as the measure of neuroticism.

Sexual assault effects. Whether or not participants experienced sexual assault, as well as its long-term effects, were assessed using a scale developed for the MIDUS II in which participants indicated whether they had experienced any of 20 stressful life experiences. Participants were presented with a list of traumatic life events and asked to check a box indicating if that experience had happened to them. Sexual assault history was assessed via

whether or not participants checked the box labeled “Sexually assaulted (e.g. forced sexual intercourse or other unwanted sexual contact).” Those who responded affirmatively were then asked to rate “How did this affect you in the long run?” on a -2 (*very negative*) to 2 (*very positive*) scale.

Results

The present work had two main objectives. The primary objective was to evaluate differences between those who have and those who have not been assaulted on a number of health and psychological factors. We assessed both the differences in these factors between groups, as well as the relationship between psychological factors and health. A secondary objective was to assess whether, among victims, there was any relationship between their perception of the long-term effects of their assault and psychological as well as health outcomes.

Multivariate analysis of variance (MANOVA) was conducted to assess sexual assault history (yes vs no) on the chosen variables of health and psychological factors. The multivariate effect was significant by sexual assault history $F(19, 692) = 7.29$, $p < .01$. Univariate tests showed that there was no difference between the two groups with respect to biological health factors. There were no significant differences between groups with respect to overall biological health risk $F(1, 710) = .19$, $p = .66$, and the two groups did not differ with respect to inflammation and cholesterol. However, they did differ with respect to systolic blood pressure; victims of assault has higher blood pressure than their non-assaulted peers, $F(1, 710) = 1.71$, $p < .0$. BMI also did not differ between the two groups.

There were significant differences between the two groups with respect to both self-reported health measures. Those who had been assaulted reported experiencing more chronic

conditions in the past year, $F(1, 710) = 49.83$, $p < .01$, and they had poorer self-rated health than those who had never been assaulted, $F(1, 710) = 34.53$, $p < .01$.With respect to eudaimonic well-being, those who has been assaulted scored lower on overall psychological well-being than those who had never been assaulted, $F(1, 710) = 43.30$, $p < .01$, and this pattern was true for all six factors of well-being. Neuroticism was higher among those who had been assaulted, $F(1, 710) = 23.49$, $p < .01$. Other factors of personality were additionally measured, and victims also reported lower conscientiousness, $F(1, 710) = 5.66$, $p < .05$. The pattern of findings was largely the same if examining only female participants, though extraverison was also lower among victims when considering only female victims. Demographics for all variables are listed in Table 6.

Although there were not group differences in biological health, the two groups differed with respect to their self-rated health, with victims reporting poorer health. The relationship between sexual assault history (whether or not one had been assaulted) and self-rated health was partially mediated by psychological well-being. As illustrated in Figure 2, there was a significant relationship between sexual assault history and well-being, $b = 22.03$, $t(733) = 5.79$, $p < .01$, as well as between psychological well-being and self-rated health, $b = .01$, $t(732) = 7.94$, $p < .01$. In addition to a direct effect between sexual assault history and self-rated health, $b = .53$, $t(732) = 3.49$, $p < .01$, the bootstrapped indirect effect was .29, with the 95% confidence interval ranging from .23 to .82. A Sobel test was conducted and found partial mediation in the model, $z = 4.65$, $p < .01$.

Further, as illustrated in Figure 3, the relationship between sexual assault history and self-rated health was also partially mediated by neuroticism. There was a significant relationship between sexual assault history and neuroticism, $b = -.30$, $t(731) = -4.87$, $p < .01$, as well as

between neuroticism and self-rated health, b = -.50, $t(730)$ = -5.57, $p < .01$. In addition to a direct effect between sexual assault history and self-rated health, b = .67, $t(730)$ = 4.41, $p < .01$, the bootstrapped indirect effect was .15, with the 95% confidence interval ranging from .08 to .25. A Sobel test was conducted and found partial mediation in the model, z = 3.63, $p < .01$.

While self-rated health and biological health were significantly correlated among both victims (-.19) and non-victims (-.19), victims' biological health was not correlated with the number of chronic conditions that they reported. Further, among victims themselves, there was no correlation between their perceived long-term effects of the assault and self-rated or biological health. Self-reported long-term effects were only significantly correlated with neuroticism (-.21; Table 7).

Additional analyses

In order to examine this pattern of results in which the experience of sexual assault and its long-term effects were predictive of psychological and health outcomes, additional analyses were performed, assessing outcomes for those who have experienced different forms of adversity. Physical assault and spousal infidelity were chosen because physical assault is the other violent form of assault measured using the MIDUS II's adversity scale, and spousal infidelity was the most commonly experienced form of adversity, with 30.5% of the sample reporting being the victim of infidelity. While the sample size for physical assault was much smaller than for sexual assault, there was a similar pattern of results. The experience was predictive of poorer psychological outcomes and self-rated health, but not of biological health risk. Further, the perceived long-term effects of the assault were predictive of psychological outcomes. The experience of spousal infidelity was predictive of psychological well-being, with

lower well-being for those who had been cheated on, but it was not predictive of any other health or psychological outcomes.

Discussion

Differences between victims and non-victims

As expected, the present research found that victims of sexual assault fare more poorly psychologically than their peers. They had lower eudaimonic well-being, as well as higher neuroticism. This was consistent with the expectation that the trauma of having experienced sexual assault would be associated with a lower sense of eudaimonic well-being. Eudaimonic well-being was also associated with self-rated health; those with a greater sense of well-being rated their health to be more positive. This was consistent with expectations based on previous research regarding eudaimonic well-being's influences on health (Kim et al., 2013). The differences in self-rated health between the two groups may be due in part to how victims have a more negatively biased schema, which in turn affects their perceptions of their own health.

Neuroticism was also higher among victims, though the data cannot explain causality. First, it is possible that personality is a strongly stable factor throughout the lifetime, and someone higher in neuroticism may be more likely to be a target of abuse. Second, the trauma of assault may lead one to be more anxious or depressed and thus have poorer emotional stability, as previous research has found that exposure to negative life events is associated with increases in neuroticism (Jeronimus et al., 2014). Further, there could be some combination of those two possibilities, in which negative life events are associated with neuroticism, which is also associated with increased risk of experiencing negative life events.

Victims also fared more poorly with respect to self-reported factors of health; they rated their health more poorly than their peers, and they also reported a greater number of chronic conditions. However, this group difference in self-reported health was not reflected in biological measures of health. Although there was a difference in cardiovascular health, wherein victims had higher blood pressure, victims did not differ from non-victims with respect to inflammation nor to overall biological health. The question then arises of why assault victims reported poorer health than their peers when their biological health did not differ. This lack of difference in biological health between groups could be considered surprising due to previous research on how women who have experienced intimate partner violence have elevated levels of inflammation (Newton et al., 2011). However, such research rolls multiple forms of abuse, such as physical abuse, into a single factor. Lifetime incidence of sexual assault as a single factor may not have as strong a connection to biological measures of health as overall measures of abuse or measures that examine the severity or frequency of assault.

Long-term effects of sexual assault

In addition to group comparisons between those who had and had not been sexually assaulted, additional analyses were run among the victims themselves to see if any relationship exists between participants' self-reported long-term effects of the assault and their ratings of their health. Self-reported long-term effects of assault were not correlated with either self-reported health or eudaimonic well-being. However, eudaimonic well-being itself was correlated with self-reported health, both self-rated health and the reported level of chronic conditions. Although victims had lower eudaimonic well-being than their peers, victims' level of well-being was not correlated with their perception of how negative or positive of an effect the assault had on their

life in the long-run. This may be due to sampling, as the majority of participants viewed their assault as having some degree of long-term negative impact on their life overall, rather than a neutral or positive one. It may also be due to how even those who viewed the assault as having a very negative impact on their life may find self-actualization or a sense of flourishing through other areas of their life. For instance, a victim of assault is capable of finding a sense of purpose through their work or developing positive relationships with their family. The majority of participants reported that their first (or only) experience of sexual assault occurred while they were under the age of 18, however, the participants at the time of sampling were in their 50s on average. Even if a participant viewed their assault as having an overall negative impact on their life, they still had many years between the assault and the time of sampling with which to develop a sense of eudaimonic well-being in other areas of their life.

While the reported long-term effect of assault was not correlated with self-reported health, it was correlated with neuroticism, which was correlated with both the number of chronic conditions reported and self-rated health. Neuroticism was greater among those who viewed their assault as having more negative long-term consequences on their life. Similarly to what was stated above, this finding can be interpreted multiple ways. The first is that more negative long-term effects of assault may lead one to become higher in neuroticism, and neuroticism is subsequently related with evaluating one's health as poor. Another interpretation is that individuals who are higher in neuroticism are more vigilant towards threat, which not only leads them to rate their health more poorly, but also leads them to perceive that their sexual assault had a more severe impact on their life.

Limitations and future directions

One limitation of the present work is causality. With the current data, it is unknown whether poor self-rated health and number of chronic conditions follows or precedes eudaimonic well-being or neuroticism. Sexual assault history similarly is limited in relation to causality. While it is perhaps to be expected that those who have been assaulted have lower eudaimonic well-being and are higher in neuroticism than their peers, the nature of the variables and study itself makes it impossible to know whether or not those psychological traits were caused by the assault or are risk factors for assault itself.

Another limitation is the measure of long-term effects of assault. The long-term effects of assault were assessed using victim's self-evaluations of how overall negative or positive of an effect that the assault had over their lifetime. These ratings are a subjective evaluation of the assault, and thus open to bias due to psychological factors such as neuroticism. It would be of interest for future work on the effects of sexual assault to examine additional factors of sexual assault that are less subjective, such as the type or frequency.

As stated above, one potential source of the lack of difference in biological health between victims and non-victims may be the chosen measure of assault history. The present research may deal with only single-incidences of assault, whereas abuse that occurred more frequently and during development may have a greater impact on health. This possibility is addressed in Chapter 4.

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Table 6. *Descriptive statistics and differences between means of all variables between those who reported having been sexually assaulted versus those who had not been assaulted*

	Assaulted		Never Assaulted		
	M	SD	M	SD	p
Physiological					
BHR	0.06	1.02	0.01	1.00	0.66
IL-6	0.34	0.30	0.31	0.33	0.41
CRP	0.20	0.49	0.13	0.49	0.19
SBP	2.10	0.07	2.12	0.06	<.01
Ratio Cholesterol	0.55	0.16	0.54	0.15	0.67
BMI	1.47	0.10	1.45	0.08	0.16
Personality					
Neuroticism	2.28	0.63	1.97	0.63	<.01
Conscientiousness	3.29	0.50	3.41	0.44	0.02
Extraversion	3.05	0.63	3.15	0.56	0.05
Agreeableness	3.50	0.46	3.42	0.51	0.14
Openness	3.01	0.53	2.94	0.52	0.21
Psychological Well-being					
Overall PWB	216.69	39.62	238.69	32.56	<.01
Autonomy	36.16	6.36	37.78	6.64	<.01
Environmental Mastery	33.88	8.47	39.78	7.23	<.01
Personal Growth	37.84	7.97	39.98	6.36	<.01
Positive Relations w/ Others	38.59	7.75	41.61	6.62	<.01
Purpose in Life	36.88	7.57	40.04	6.28	<.01
Self-Acceptance	33.33	9.87	39.59	7.73	<.01
Self-reported health					
Self-rated health	6.89	1.64	7.70	1.39	<.01
#of chronic conditions	3.64	2.80	2.11	2.03	<.01

Note. Ratio cholesterol refers to the ratio of total-to-HDL cholesterol. All values for the four components of BHR as well as BMI represent log-transformed scores.

Table 7. *Correlations among variables of interest among (A) participants who reported no experience of assault and (B) participants who reported having experienced sexual assault*

A. Non-victims	1	2	3	4	5	
1. BHR	*					
2. Self-rated health	-.19*	*				
3. # of chronic conditions	.15*	-.44*	*			
4. PWB	0.01	.32*	-.26*	*		
5. Neuroticism	-0.08	-.20*	.26*	-.51*	*	

B. Victims	1	2	3	4	5	6
1. BHR	*					
2. Self-rated health	-0.19*	*				
3. # of chronic conditions	0.14	-.42*	*			
4. PWB	0.05	.31*	0.05	*		
5. Neuroticism	-0.10	-.28*	.24*	-.51*	*	
6. Long-term effect	0.05	0.12	-0.12	0.11	-.21*	*

Note. Long-term effect refers to participants' ratings of how negative or positive of an effect their assault had on their life in the long run.

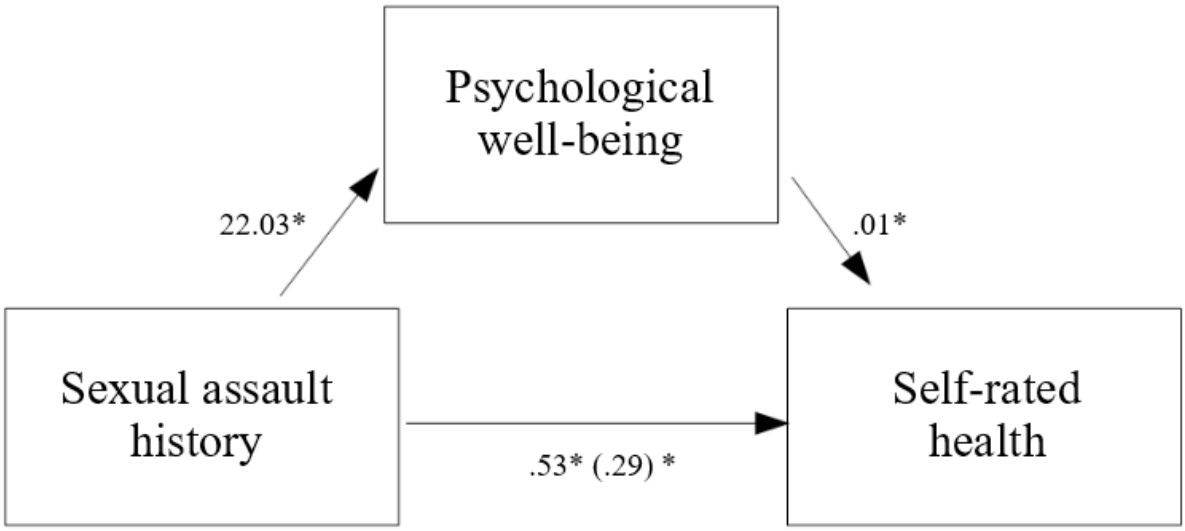

Figure 2. Psychological well-being mediating the relationship between sexual assault history and self-rated health. Sexual assault history was coded as assaulted (1) versus never assaulted (2), thus higher values for "sexual assault history" indicates no assault. Those who have been assaulted have lower psychological well-being as well as poorer self-rated health.

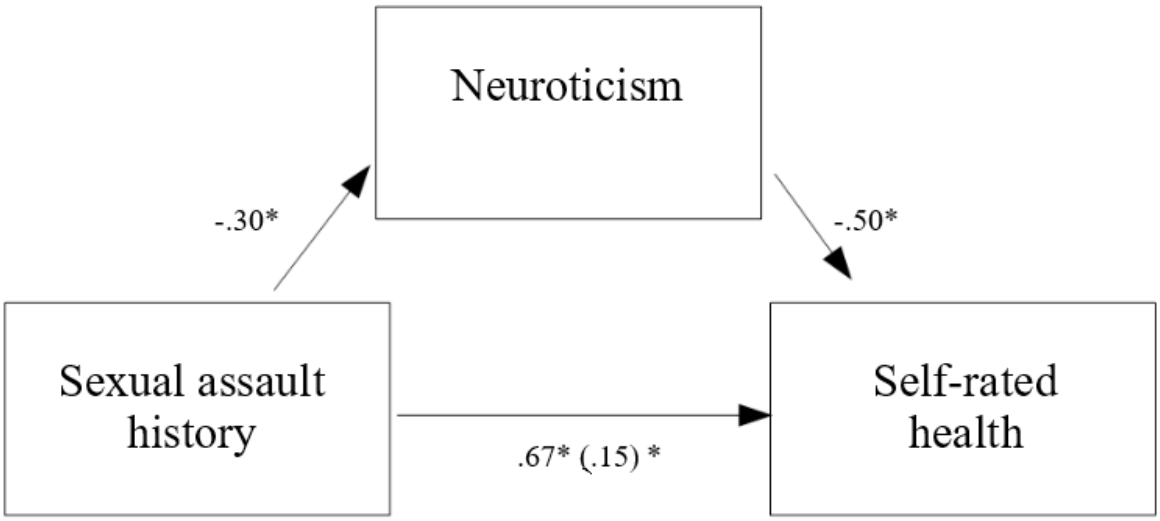

Figure 3. Neuroticism mediating the relationship between sexual assault history and self-rated health. Sexual assault history was coded as assaulted (1) versus never assaulted (2), thus higher values for "sexual assault history" indicates no assault. Those who have been assaulted have higher neuroticism and report poorer self-rated health.

Chapter 4

The Biological Cost of Childhood Sexual Abuse Is Exacerbated by a Sense of Meaning in Life

The sexual abuse of children is a hidden epidemic and a public health concern. Within the United States, stories of large-scale organized sexual abuse are continually uncovered. A 2018 grand jury report shows that, over the course of 70 years, over 300 priests in Pennsylvania sexually abused more than 1,000 children. It is believed that thousands more unidentified victims may have been abused during this time ("40th statewide investigating grand jury", 2018). Notably, such reports only address abuses that take place within institutions, but children are more often victimized by close others such as family members (Finkelhor et al., 1990; De Jong, 1989). Among college students, Finkelhor (1980) found that 19% of females and 9% of males in the United States reported having been sexually victimized as children. This resembles the global rate of childhood victimization, which is between 18-19.7% of girls and 7.6-7.9% of boys (Stoltenborgh, et al., 2011; Pereda et al., 2009). There is a need for more scientific studies on how the psychological scars left from childhood sexual abuse might be countered or buffered. The current work explored the possibility that a sense of a meaningful life, assessed by a sense of control and eudaimonic well-being, could potentially buffer against the adverse effect of early sexual abuse. Surprisingly, we found that the sense of eudaimonic well-being and control was negatively predictive of biological health among the victims of the most severe childhood sexual abuse.

Prevalence of Abuse

To many, stories such as the above are a shocking instance of large-scale organized sexual abuse. But while the details of the report are sickening, many clinicians, practitioners, and researchers of sexual abuse and trauma are not surprised by this report. In Australia, the Royal Commission into Institutional Responses to Child Sexual Abuse has identified over 4,000 institutions in which childhood sexual abuse (CSA) has taken place (Brown, 2017). Surveys of adults describing their experiences of CSA report that between 70% to 90% of abusers are either a family member or an acquaintance of the victim (Finkelhor et al., 1990). Abuse by strangers is the minority of cases, compared with abuse committed by one in a position of authority-such as priest or teacher-or abuse committed by a family member. In the United States, Child Protective Services records indicate that 7.6% of children with a documented history of maltreatment had been sexually abused (U.S. Department of Health and Human Services, 2009). However, not all cases of abuse are reported, substantiated, and documented by social services.

The rates reported by adults reflecting back on their childhood suggest an even greater incidence of abuse. Over 19% of women with PTSD report that their most traumatic experience was CSA (Kessler et al., 1995) and 25-35% of women reporting having experienced any trauma report CSA as one of the traumas (Cloitre, Cohen, Han, & Edelman, 2001; Breslau et al., 1997). As noted above, 19% of college-age females and 9% of college-age males reported being sexually victimized as children (Finkelhor; 1980). Globally, the prevalence of victimization is between 18-19.7% of girls and 7.6-7.9% of boys (Stoltenborgh, et al., 2011; Pereda et al., 2009).[1]

1Barth et al. (2013) found prevalence rates as high as 69% for girls and 47% for boys when assessing global rates of both contact (e.g. molestation) and non-contact abuse (e.g. indecent exposure). Variance in prevalence rates are due to differences in study procedure such as sample (e.g. those reported to Child Protective Services vs. self-report) and definition of abuse (e.g. only

If one uses a more liberal definition of abuse and includes instances of when someone attempted (in addition to instances where someone succeeded at) engaging a child sexually, the rates for girls increases. Using that definition, 26.6% of girls and 5.1% of boys ages 15-17 reported having experienced sexual abuse (Finkelhor et al., 2014). Earlier research by Finkelhor et al. (1990) found a similarly high incidence rate in a national survey of adults when they used a broader definition of sexual abuse. If one does not restrict the definition of abuse to instances of an adult physically engaging with a child, instead including acts such as an adult attempting to molest or instances of indecent exposure, 27% of adult women and 16% of adult men report being the victim of some form of CSA.

Characteristics of Victims

Female children are victimized more often than male children (at rates more than two to three times as high), abuse of female children begins at younger ages than males, and the types of victimization also differ by sex (Turner et al., 2017; Sedlak et al., 2010; Faller, 1993; Faller, 1989). While males are more likely than females to be abused by a stranger, females are more likely to be abused by an acquaintance or family member (Soylu et al., 2016; Finkelhor et al., 1990; Faller, 1989). Abuse by a family member includes parents, step-parents, and siblings, as well as extended family members such as a grandparent or cousin (Sariola & Uutela, 1996; Finkelhor et al., 1990; De Jong, 1989). There is some evidence that the effects of CSA may differ between males and females, e.g. females are at a greater risk for health problems following abuse (Thompson, Kingree, & Desai, 2004). However, Wisdom et al. (2008) note that sex differences

recording rates of forced intercourse vs. also recording rates of fondling and/or indecent exposure; Barth et al., 2013; Stoltenborgh et al., 2011; Putnam, 2003). The most conservative method, assessing only forced intercourse, finds that globally, 9% of girls and 3% of boys have been victims of CSA.

observed may be due to the differences in the type of abuse male and female children are exposed to, rather than a difference in response that is inherent to one's sex. For example, female children are more likely than male children to have multiple abusers (Soylu et al., 2016), and those with multiple abusers have their victimization begin at an earlier age, are exposed to abuse more frequently and for a longer duration, are subject to additional non-sexual forms of trauma, and experience more severe abuse (Salter, 2012; Casey & Nurius, 2005). Thus, the tendency for females to experience more severe and complex forms of abuse may lead to a pattern in which female victims experience differing effects than males.

Effects of Childhood Sexual Abuse

Childhood sexual abuse (CSA) leaves unique psychological scars. Sexual abuse is committed intentionally, often by close others such as a relative or an authority figure (Finkelhor et al., 1990; De Jong, 1989, Finkelhor, 1980). Thus, it may shatter a victim's sense of trust. Such abuse alerts victims to the possibility that others, even those who are close, can have ill intent. This disrupts one's ability to feel secure in social relations and to feel in charge of their social world. In this respect, childhood sexual abuse stands out among adverse childhood experiences one could experience such as illness, accidents, or living in poverty. While such experiences can be severe and even life-threatening, they do not shatter one's sense of trust and disrupt one's ability to have a fundamental sense of security or autonomy in interpersonal social relations.

The psychological scars of CSA are reflected in multiple negative outcomes, including behavioral, psychological, and physiological.

Behavioral. Childhood sexual abuse is associated with a number of health and sexual behaviors. Those exposed to CSA are more likely to use and abuse drugs and alcohol (Afifi et al.,

2014; Chartier et al., 2009; Rind et al., 1998; Neumann et al., 1996; Springs & Friedrich, 1992), as well as to smoke and to smoke a heavier amount (Chartier et al., 2009; Springs & Friedrich, 1992). The experience of CSA is linked with an early age of becoming sexually active, having more sexual partners before the age of 18, a higher number of sexual partners in general, as well as a higher rate of engaging in unprotected sex and prostitution (Arriola et al., 2005; Paolucci et al., 2001; Springs & Friedrich 1992). It is also associated with suicidal ideation and suicide attempts (Afifi et al. 2014; Paolucci et al., 2001; Ring et al., 1998; Neumann et al., 1996; Jumper 1995), as well as non-suicidal self injury (Klonsky & Moyer, 2008; Paolucci et al., 2001; Neumann et al., 1996).

When faced with difficulties, children who experienced CSA show differing responses than their peers. Those who are victims of CSA show a greater tendency to internalize their problems (e.g. withdrawal, depression) as well as to externalize them (e.g. expressing anger and aggression; Lewis et al., 2016). Boy children externalize their problems more than girls (Gauthier-Duchesne, Hébert, & Daspe, 2017), though there is mixed evidence whether boys also internalize their problems more (Gauthier-Duchesne, Hébert, & Daspe, 2017; Coohey, 2010).

Psychological. Maniglio (2009) noted that CSA is a risk factor for developing psychopathology. Both men and women who were victims of CSA have impaired mental health and a greater sense of psychological distress compared with their peers (Chartier, Walker, & Naimark, 2009; Najman, Nguyen, & Boyle, 2007; Marx & Sloan, 2003). The experience of CSA is associated with having more diagnosed mental disorders than those who were not abused (Afifi et al., 2014; Rind & Tromovitch, 1997). Depression is linked with CSA, and those who have been abused show more depressive symptoms than their non-abused peers (Paolucci et al.,

2001; Rind et al., 1998; Neumann et al., 1996; Jumper, 1995). Childhood sexual abuse is also associated with anxiety and borderline personality disorder (Fossati, Madeddu, & Maffei, 1999; Rind et al., 1998; Neumann et al., 1996; Jumper, 1995). While CSA is associated with having PTSD as well as number of PTSD symptoms (Marx & Sloan, 2003; Paolucci et al., 2001), traumatic experiences including CSA are also linked with other forms of traumatic response that do not fit the diagnostic criteria for PTSD (Van der Kolk et al., 2005). As measured by Van der Kolk et al. (2005), these symptoms include difficulty with regulating affect or impulses (e.g. anger, suicidal ideation), memory and attention deficit (e.g. amnesia, dissociation), warped self-perception (e.g. shame, guilt), disturbed interpersonal relations (e.g. loss of trust, re-victimization), somatization (e.g. chronic pain, digestive problems), and altered sense of meaning (e.g. hopelessness, loss of beliefs). The relationship between trauma and somatization and dissociation has also been found specifically in those who experienced CSA (Rind et al., 1998; McCauley et al., 1997; Neumann et al., 1996; Jumper, 1995). In addition to somatization, there is evidence that the experience of CSA is also associated with physiological outcomes.

Physiological. The psychological scars of CSA are reflected in negative health outcomes. Those who experienced CSA are at an increased risk of reporting health problems (Afifi et al., 2016), and females are at more risk for health problems following any type of abuse (Thompson, Kingree, & Desai, S., 2004). Dickinson et al. (1999) noted that for women, outcomes of CSA are "dose-responsive"; severity of abuse (including no abuse) is predictive of the number of medical problems reported. Female victims of CSA are more likely to report gynecological problems and pelvic pain than their peers (Irish, Kobayashi, & Delahanty, 2009; Latthe et al., 2006). Overall, victims of CSA report more pain than their peers, and they are more likely to have chronic

fatigue syndrome (Afifi et al., 2016; Irish, Kobayashi, & Delahanty, 2009; Roman et al., 2002). Being subjected to sexual abuse in childhood also increases the odds of facing obesity in adulthood (Afifi et al., 2016). Among young adults, being a female who experienced specifically penetrative CSA is predictive of a greater body mass index (BMI) as well as being overweight by age 21 (Mamun et al., 2007). Overall, adults seeking weight loss for obesity are more likely than others to have been sexually and physically abused as children (Felitti, 1993). Additionally, those who experienced CSA are more likely than their peers to report a number of health problems including arthritis, back problems, high blood pressure, emphysema, cancer, stroke, gastrointestinal problems, cardiopulminary symptoms (such as chest pain), and diabetes (Afifi et al., 2016; Irish, Kobayashi, & Delahanty, 2009). There is mixed evidence on whether or not a history of sexual abuse is predictive of metabolic syndrome, but a relationship has been found only for females and not for males (Davis, 2015; Lee, Tsenkova, & Carr, 2014).

Protective Factors

Of interest is whether there are factors that can buffer against these negative health outcomes of adversity.

Sense of Control. Previous research has shown that a sense of control can serve as a buffer against negative experiences associated with adverse circumstances. Lachman & Weaver (1998) examined the role of a sense of control in relation to social class. They found that those of lower social class reported poorer health. However, those who were of lower social class but who also believed that they had a sense of control did not show this reduction in health and had health similar to those of high social class. Other research has connected a sense of control with traumatic forms of adversity, such as physical abuse in childhood or the death of a parent.

Lifetime experience of traumatic experiences is associated with mortality, but no relationship exists between trauma and mortality for those high in a sense of control (Elliot et al., 2018). This relationship may be expected; having a sense of control reduces one's sense of being under threat (Taylor & Stanton, 2007), and a reduction in one's sense of threat may lead to lower inflammatory stress responses. Some work has been done specifically focusing on those who experienced childhood sexual trauma. King et al. (2015) examined the effect of personal mastery, a component of a sense of control, among pregnant women who reported that they were victims of CSA. They found that CSA victims generally experienced more depressive symptoms than non-victims, however, victims who had a sense of personal mastery did not show this increase in depressive symptoms. Personal mastery buffered against that negative mental health effect of CSA. However, the benefit of personal mastery had its limits. Although personal mastery alone was linked with better self-reported health, there was no interaction between personal mastery and CSA in relation to self-reported health. This past research on a sense of control and adversity can be expanded upon. For example, King et al (2015) only examined self-reported health, and there is a need to examine the relationship between CSA and biological measures of health. Additionally, such findings can be expanded upon by examining the broader population of CSA victims rather than a subset such as pregnant women. There is also a need for research that considers the severity of abuse as well as research that examines multiple buffering factors rather than a single psychological variable. Given that there is research on how other psychological variables besides a sense of control can serve as a protective factor, other psychological variables must be considered.

Eudaimonic well-being. Other research suggests that a sense of control is not the only buffer against negative health effects of adverse life events; there are other psychological factors serving as protective factors. For example, threatening experiences activate gene expressions related to inflammation, and optimism is inversely related to this gene expression (Uchida et al., 2018). This may account in part for how optimists experience positive health effects (Carver, Scheier, & Segerstrom, 2010). Further, the perception that one is resilient is also associated with the expression of these pro-inflammatory genes. Those who have PTSD but believe themselves to be resilient show inflammatory gene expressions similar to those without PTSD (Kohrt et al., 2016).

A sense of well-being may also serve as a protective factor. Well-being is considered to take two forms: hedonic and eudaimonic. Hedonic well-being is well-being associated with the feeling of pleasure and the avoidance of pain, and it is captured by assessing one's positive emotions or sense of satisfaction with life. Eudaimonic well-being is the form of well-being associated with whether or not one is flourishing in life, for example, whether one feels that their life has meaning and purpose or whether one feels a sense of autonomy (Keyes & Annas 2009; Ryan & Deci, 2001). In previous psychological research, eudaimonic well-being is termed psychological well-being (PWB) and considered to be comprised of six factors: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance (Ryff, 1989; Ryff & Keyes, 1995).

Eudaimonic well-being has been associated with positive health outcomes in previous research. Having a sense of purpose in life is associated with outcomes such as longevity and reduced levels of inflammation (Hill & Turiano, 2014; Friedman & Ryff, 2012; Ryff, Singer, &

Love, 2004). These findings suggest that eudaimonic well-being could potentially serve as a buffer against negative health outcomes of adversity. Further, eudaimonic well-being is of particular interest to investigate in relation to CSA because of how it may be related to the traumatic experience of CSA. Sexual abuse in childhood leaves a unique psychological scar and damages trust and the feeling of agency one has over their social world, standing out among other adverse childhood experiences such as illness. This form of abuse likely calls into question or limits one's sense of eudaimonic well-being. While prior research into the general population has found associations between eudaimonic well-being and positive health outcomes, this relationship may not exist or may be more nuanced in a population such as CSA victims because they likely have lower well-being than the general population.

Present Work

The goal of the present work was to explore whether a sense of control or of eudaimonic well-being can serve as a buffer against ill effects of abuse. As discussed above, there is a need for research that assesses the relationship between the severity of CSA one experienced and biological rather than self-reported measures of health. It is possible that those who experienced more severe abuse suffer greater effects, which in turn may be reflected in increases of biomarkers of health risk.

Early childhood stressors are linked with inflammation and chronic disease in adulthood due to how developmental stress affects the functioning of the HPA axis, leads one to interpret their environment as more threatening, and disrupts one's ability to engage in self-regulating behaviors such as refraining from overeating. (Miller et al., 2011). Although there was no relationship found between a history of sexual assault and biological health in Chapter 3, the

study was limited in that it could not account for the severity of said assault. Further research is needed to address whether the severity of the trauma experienced is, in fact, associated with biological health. The relationship between the severity of particularly childhood sexual abuse and biomarkers in adulthood remains to be investigated in detail. Previous research on the severity of childhood abuse and its relationship with biomarkers in adulthood largely examines the impact of multiple forms of abuse rather than focusing on the specific impact of sexual forms of abuse. For example, Danese et al. (2007) found that the intensity of maltreatment one experienced as a child was associated with inflammation (c-reactive protein) in adulthood. However, they did not focus specifically on sexual abuse nor did they assess the severity of such abuse. Instead, they broadly defined childhood maltreatment, assessing whether someone experienced maternal rejection, harsh discipline, lack of a consistent primary caregiver, physical abuse, and sexual abuse (occurring between the ages of 3 and 11). The level of maltreatment experienced was assessed as the number of these adverse circumstances someone was exposed to; their work provides no information as to the severity of specifically the sexual abuse experienced and its relationship with inflammation. Kiecolt-Glaser et al. (2011) noted that those abused as children had higher levels of inflammation (interleukin-6) than those who were not abused. However, they assesses whether participants experienced either emotional, physical, or sexual abuse, combining responses to divide participants as abused vs not abused. Thus, they did not examine the specific effect of sexual abuse nor its severity.

Research that does focus specifically on sexual abuse does not focus on biomarkers of health risk. As noted above, King et al. assessed the self-rated health of abused women, and also did not account for severity of abuse. Fergusson, McLeod, & Horwood (2013) studied the

relationship between CSA reported at ages 18 and 21 with well-being and physical health in adulthood. They divided participants into four groups: never experienced CSA, experienced non-contact abuse, experienced contact-abuse without penetration, and experienced penetrative abuse. Using these groups as a measure of severity, they found that those who experienced more severe abuse visited the doctor more times in the previous year, which was considered a measure of physical health. There is a need for additional research that examines the relationship between the severity of CSA and biological measures of health (e.g. inflammation). Additionally, there is a need to assesses psychological factors that moderate the relationship between childhood abuse and adult health.

The present research fills multiple gaps in the literature by focusing on the specific effects of sexual abuse, examining the role of the severity of abuse, investigating health outcomes using biomarkers in addition to self-report, examining a sample of a broad population, and by investigating whether a sense of control or eudaimonic well-being can serve as a buffer against any ill health outcomes associated with abuse. Although Chapter 3 found no group differences between those who had and had not experienced a lifetime incidence of sexual assault with respect to biological health, the absence of group difference may be due to how many instances of lifetime sexual assault are isolated incidences. An adverse effect of sexual trauma could emerge once one accounts for the frequency of assaults or abuse. Thus, although Chapter 3 found no relationship between whether or not one has been assaulted and their biological health, the present work addresses both developmental trauma specifically as well as the severity of abuse. It was expected that those who experienced more severe abuse experience more biological health risk. Further, previous research has noted that a sense of control can serve

as a psychological resource that protects one from the ill effects of adversity. It is possible that even those who experienced severe sexual abuse in childhood are able to develop a sense of control or eudaimonic well-being. The present research tests whether these traits could buffer against any ill effects of abuse. It is expected that those with more severe abuse experience more biological health risk, and that a sense of control and one's sense of well-being moderate the relationship between abuse severity and health, acting as a buffer against negative outcomes. Specifically, it is predicted that a sense of control (SoC) and a sense of eudaimonic well-being would serve as a buffer against ill effects of severe CSA, such that those with an above average sense of these psychological traits would not suffer the same degree of biological health risk as their peers.

Method

Participants

Participants were drawn from the Midlife in the United States (MIDUS) survey and were those who reported experiencing some degree of sexual abuse in childhood. The participants for the initial MIDUS, conducted in 1995, were 7,108 people drawn from across the United States using random digit dialing. A follow-up survey, the MIDUS II, was conducted in 2004 using the majority (n = 4,963) of the original MIDUS participants. A subset of those who went on to participate in the MIDUS II survey (n = 1,054, 578 females, Mage = 58.04) provided additional data by participating in an overnight session at a clinical research center where biomarker data were collected. The participants in the current study were a subset of 240 MIDUS II participants for whom there is both biomarker data and who reported some degree of childhood sexual abuse (23%). The selected sample of MIDUS II participants was multi-racial (217 European

Americans, 7 African Americans, 2 Native Americans, 2 Asian Americans, 9 others, and 3 missing), albeit a largely (90.4%) European American sample. Of the 240 participants, 65 were male and 175 were female, with a mean age of 57.58.

Measures

Biological Health Risk. Biological health risk (BHR) was assessed using biomarkers of both inflammation and cardiovascular risk.

Inflammation was assessed using serum levels of interleukin 6 (IL-6) and c-reative protein (CRP). IL-6 is an inflammatory cytokine that indicates an immune response (Ishihara & Hirano, 2002). CRP is a protein found in blood plasma that increases in response to inflammation, with higher levels indicating an inflammatory response (Pepys & Hirschfield, 2003). Blood samples from which serum levels of IL-6 and CRP levels were measured were frozen and shipped to Biocore Laboratory (Madison, WI) for analysis.

Cardiovascular risk was assessed with the ratio of total cholesterol to HDL cholesterol along with systolic blood pressure. The blood samples from which cholesterol values were assessed were frozen and shipped to Meriter Labs (Madison, WI). Samples were assayed using a Cobas Integra analyzer. Systolic blood pressure values were calculated using the average of two blood pressure recordings. Participants' blood pressure was assessed three times with 30-second rest periods between recordings, and the two recordings with the most similar scores were averaged in order to develop participants' SBP value. Outlier scores for the four biomarkers were winsorized at ±3 standard deviations from the mean and log-transformed following the procedure in Kitayama et al. (2015; 2018) in order to reduce skewness. The four biomarkers were combined into a single factor for an index of BHR following Kitayama et al. (2015; 2018).

Self-rated Health. Participants' subjective ratings of their current health were measured using a single-item measure. They were asked to respond to the question "Using a scale from 0 to 10 where 0 means 'the worst possible health' and 10 means 'the best possible health,' how would you rate your health these days?" using the scale described in the prompt. Participants additionally rated their beliefs regarding their future health by responding to the question "Looking ahead ten years into the future, what do you expect your health will be like at that time?" also on a 0 (*worst possible*) to 10 (*best possible*) scale.

Childhood Sexual Abuse. The severity of CSA experienced was assessed using responses on the sexual abuse subscale of the Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998; Appendix C). The CTQ is a questionnaire designed to measure multiple factors of trauma potentially experienced in childhood: sexual abuse, physical abuse, emotional abuse, physical neglect, emotional neglect, and minimization/denial. The sexual abuse subscale used is comprised of five items, such as "When I was growing up, someone molested me.", and answered on a 1 (*never*) to 5 (*very often*) scale ($\alpha = .89$). This scaling system means that participants with a score of 5 never experienced sexual abuse to any degree, whereas anyone who scored 6-25 was a victim of some level of abuse and thus was part of the present sample. According to the CTQ, scores of 6 or 7 are considered mild, 8-12 as moderate, and 13 and above as severe abuse. For this sample, the mean level of reported abuse was 11.31, a moderate level. Those one standard deviation below the mean were those categorized as having experienced mild abuse, and those one standard deviation above the mean were severely abused.

Sense of Control. Sense of control was measured using a 12-item measure that assesses two dimensions of control: personal mastery and perceived constraints (Lachman & Weaver,

1998). Personal mastery is the belief that one can accomplish their goals, and it was measured using 4 items such as "Whether or not I am able to get what I want is in my own hands," answered on a 1 (*strongly agree*) to 7 (*strongly disagree*) scale. Perceived constraints refers to belief that one lacks control over what happens in their life. It was measured using 8 items such as "What happens in my life is often beyond my control," also on a 1 (*strongly agree*) to 7 (*strongly disagree*) scale. Control was measured by calculating the mean of the 12 items after re-coding the personal mastery items such that a higher score indicates higher values of the trait.

Eudaimonic Well-being. Participants' sense of eudaimonic well-being was assessed using the Psychological Well-being Scale (Ryff & Keyes, 1995; Appendix A). The scale is comprised of six subscales, each measuring a different factor of well-being: autonomy, environmental mastery, personal growth, purpose in life, positive relations with others, and self-acceptance. Items include questions like "I tend to worry what other people think of me." Each subscale is 7 items long, rated on a 1 (*strongly agree*) to 7 (*strongly disagree*) scale. Subscales are scored such that a higher value indicates a higher amount of that factor of well-being. The pattern of results was consistent across the various factors of well-being, thus for the purpose of discussion, the results shown are using a composite of all aspects of psychological well-being (PWB), taken as an index of overall eudaimonic well-being.

Control Variables. Control variables were selected due to their potential impact on any observed relationship between severity of abuse and biomarkers: demographics (age, sex, and educational attainment), health behaviors (smoking status, alcohol use), and health status (body mass index [BMI], number of self-reported chronic conditions).

Demographic. The sample was largely female (73%). Mean age at assessment was 57.58. The highest level of education that participants attained was used in order to create an education score. The scale ranged from 1 (*8th grade*) to 12 (*Ph.D. or other professional degree*). Sex, age, and education were controlled for because previous research indicates that rates of cardiac arrest vary depending on age and sex (Lloyd-Jones et al., 2009), older adults often report lower purpose than middle aged adults (Ryff, & Singer, 1998), and educational attainment is correlated with health outcomes (Marmot, 2007).

Health Behaviors. Smoking and alcohol use affect the chosen biomarkers of cardiovascular health (Bermudez et al., 2002; De Oliveira e Silva et al., 2000), and thus were controlled for. Participants' smoking behavior (current, former, or never) was recorded a binary response (0 = *no*; 1 = *yes*). This score was used to create two smoking indices: current and former smokers coded against "never smokers." Participants were also asked to report the number of alcoholic drinks they consumed each week, and the value was used to create an alcohol consumption score. Outlier scores were winsorized at ±3 standard deviations from the mean.

Health Status. Participants' health status was assessed using their BMI (kg/m^2) and the number of chronic conditions they self-reported. Participants were asked to check the number of chronic conditions they had off of a list of 30 conditions, e.g. diabetes or migraines (Appendix B). Childhood abuse is associated with obesity and chronic health problems (Afifi et al., 2016), which in turn are associated with inflammation (Wang, & Nakayama, 2010).

Descriptive statistics for the control variables are available in Table 8. Correlations for the independent and dependent variables are available in Table 9.

Results

Of interest was whether psychological factors could serve as a buffer against ill health effects of abuse. Specifically, the current research primarily examined whether the relationship between the severity of CSA experienced and BHR was moderated by either a sense of control or by eudaimonic well-being, assessed with the psychological well-being scale. It was predicted that those psychological factors would serve as a buffer, such that they would prevent association between severe abuse and ill health. Additional analyses were performed to see if the effects were consistent for self-rated health, as well as whether the pattern of results was the same or differed across other forms of abuse.

Sense of Control

Predictions regarding sense of control were tested using four regression models. Each model included the main effects of sense of control (SoC), the severity of childhood sexual abuse (CSA), and the 2-way interaction between the variables (SoC x CSA). The four models varied relative to the control variables used: in Model 1 there were no controls, Model 2 additionally controlled for demographic variables (age, sex, education), health behaviors (alcohol consumption and smoking status) were additionally controlled for in Model 3, and Model 4 additionally controlled for health status (BMI and number of chronic conditions).

For all models, there was no significant main effect of sense of control on biological health risk. There was a main effect of severity of childhood sexual abuse in Model 2, $b = .03$, $t(230) = 2.02$, $p < .05$, though that effect became marginally significant in Model 3, where health behaviors were controlled, $b = .02$, $t(227) = 1.96$, $p = .05$. The interaction between sense of

control and severity of childhood sexual abuse was significant when controlling for all variables in Model 4, $b = .02$, $t(225) = 2.97$, $p < .01$. Overall fit for Model 4 was $R^2 = .39$ (Table 10).

To interrogate the nature of the 2-way interaction, we carried out a regression using all control variables. For those 1 SD lower than the mean in a sense of control, the relationship between CSA severity and BHR was significantly negative, $b = -.02$, $t(225) = 2.52$, $p < .05$. As CSA severity increased, BHR decreased. In contrast, for those 1 SD higher than the mean in the sense of control, the relationship between CSA severity and BHR was significantly positive, $b = .02$, $t(225) = -2.27$, $p < .05$. As CSA severity increased, BHR also increased. Thus, among those who were high in a sense of control, lower CSA severity was associated with decreased BHR, whereas higher CSA severity was associated with higher BHR (Figure 4). Additionally, CSA severity significantly predicted levels of sense of control, $b = -.04$, $t(239) = -2.94$, $p < .01$.

Psychological Well-being

As with a sense of control, the predictions regarding psychological well-being were tested in four regression models. All models included the main effects of psychological well-being (PWB) and the childhood sexual abuse severity (CSA), as well as the 2-way interaction between the variables (PWB x CSA). The models varied relative to their control variables: Model 1 contained no controls, demographic variables (age, sex, education) were additionally controlled for in Model 2, Model 3 additionally controlled for health behaviors (alcohol consumption and smoking status), and health status (BMI and number of chronic conditions) was additionally controlled for in Model 4.

There was no significant relationship between psychological well-being and biological health risk in any of the models. With respect to CSA severity, there was no main effect in

Models 1 and 4. There was an effect when controlling for demographics in Model 2, $b = .03$, $t(230) = 2.05$, $p < .05$, but it was marginal in Model 3 after additionally controlling for health behaviors, $b = .02$, $t(227) = 1.98$, $p = .05$. The interaction between psychological well-being and CSA severity was significant. The interaction hovered around significance in Models 1, $b = .001$, $t(233) = 1.92$, $p = .06$, Model 2, $b = .001$, $t(230) = 1.97$, $p = .05$, and Model 3, $b = .001$, $t(227) = 1.98$, $p = .05$. It was significant in Model 4, $b = .001$, $t(225) = 3.38$, $p < .01$. The overall fit for Model 4 was $R^2 = .40$ (Table 11).

Similarly to sense of control, the 2-way interaction between CSA severity and PWB was interrogated. For those 1 SD lower than the mean in psychological well-being, the relationship between CSA severity was significantly negative, $b = -.03$, $t(225) = -2.83$, $p < .01$. As CSA severity increased, BHR decreased. For those 1 SD below the mean of PWB, lower CSA severity was associated with higher BHR. In contrast, for those 1 SD above the mean of PWB, the relationship between CSA severity and BHR was positive, $b = .03$, $t(225) = 2.73$, $p < .01$. As CSA severity increased, so did BHR. Thus, among those who were high in PWB, lower CSA severity was associated with decreased BHR whereas higher CSA severity was associated with higher BHR (Figure 5). Additionally, CSA severity significantly predicted psychological well-being, $b = -1.22$, $t(239) = -2.74$, $p < .01$.

Additional Analyses

Hedonic Well-being. Additional analyses tested the effect of hedonic well-being using the same regression models as above, additionally controlling for hedonic well-being in a fifth model. There was no difference in the pattern of results when controlling for hedonic well-being; CSA and PWB still interacted, $b = .001$, $t(223) = 3.23$, $p < .01$. Further analyses assessed

whether hedonic well-being itself interacted with CSA severity in order to predict BHR, using the same above models and controlling for PWB in a fifth model. The pattern of results for hedonic well-being was the same as that for PWB, in which there was an interaction between well-being and CSA severity, $b = -.02$, $t(223) = -2.17$, $p < .05$.

Self-rated Health. In addition to examining the relationship between sense of control and severity in relation to biological measures of health risk, the same regression models were tested with self-rated health (both current health and predictions regarding future health) as the dependent variables. In all models, there was a significant main effect of sense of control on ratings of one's current health quality, $b = .44$, $t(228)= 3.20$, $p < .01$ (Model 4; Table 12), as well as predictions regarding one's future health, $b = .96$, $t(227)= 5.84$, $p < .01$ (Model 4; Table 13). When considering sense of control, there was a main effect of CSA severity on ratings of current health in Models 1-3, but it became marginal when additionally controlling for BMI and chronic conditions in Model 4, $b = -.04$, $t(227)= -1.98$, $p = .05$. There was no interaction between sense of control and CSA severity on ratings of current health. There was no main effect of CSA severity on participants' predictions regarding their future health. However, there was a significant interaction between sense of control and CSA severity on predictions regarding future health, $b = -.05$, $t(227)= -2.88$, $p < .01$, though only for those high in a sense of control. For those who were 1 SD above the mean in a sense of control, the relationship between CSA severity and projected future health was significantly negative, $b = -.08$, $t(227) = -2.23$, $p < .05$. As CSA severity increased, estimates regarding future health quality decreased.

There were also significant main effects of psychological well-being on ratings of one's current health, $b = .01$, $t(228)= 5.07$, $p < .01$ (Model 4; Table 14), as well as predictions

regarding one's future health, b = .02, $t(227)$= 7.27, p < .01 (Model 4; Table 15). There was also a main effect of CSA severity on ratings of current health in Models 1-3 when controlling for psychological well-being, though the effect became marginal in Model 4, b = -.03, $t(228)$= -1.81, p = .07. However, there were no effects of CSA severity on projected health 10 years into the future. Additionally, there were no interactions between CSA severity and PWB with respect to ratings of current health. There was, however, a significant interaction between CSA severity and PWB on predicted future health, b = -.001, $t(227)$= -2.87, p < .01, Model 4. For those who were 1 SD above the mean in psychological well-being, the relationship between CSA severity and projected future health was significantly negative, b = -.08, $t(227)$ = -2.21, p < .05. As CSA severity increased, estimated future health decreased. There was, however, no significant effect for those 1 SD below the mean in psychological well-being.

BMI. Additional analyses tested whether a sense of control or psychological well-being moderated the relationship between CSA severity and BMI. BMI was of interest for additional analyses because it is another physiological measure of health separate from BHR. There were no main effects of sense of control nor interactions between sense of control and CSA severity with respect to BMI. There was a main effect of CSA severity in all models, b = .004, $t(229)$ = 3.34, p < .01 (Model 4). Additionally, there were no main effects of psychological well-being in any model, nor were there any interactions between PWB and CSA severity. There was, however, a main effect of CSA severity on BMI in all models when controlling for PWB, b = .004, $t(229)$ = 3.42, p < .01 (Model 4). More severe abuse predicted greater BMI.

Other Forms of Abuse. The present research is specifically focused on sexual abuse. However, the same analyses were performed for the other four forms of abuse measured by the

CTQ (physical abuse, emotional abuse, physical neglect, emotional neglect). These analyses were performed in order to investigate whether a sense of control and psychological well-being moderate the relationship between the severity of childhood abuse and BHR for all forms of abuse, or whether the moderation is unique to sexual forms of abuse. There were no relationships between sense of control, psychological well-being, severity of abuse, and BHR when considering physical and emotional neglect or emotional abuse. When examining all MIDUS II biomarker participants who reported some level of physical abuse, there was a main effect of abuse severity on BHR in Models 1-3 when controlling for sense of control $b = .03$, $t(584) = 2.20$, $p < .05$ (Model 3) and Models 1 & 2 when controlling for psychological well-being, $b = .03$, $t(583) = 2.19$, $p < .05$ (Model 2). There were no interactions between the severity of physical abuse and sense of control or psychological well-being in relation to BHR. Thus, sense of control and psychological well-being moderate the relationship between abuse severity and BHR only when considering sexual forms of abuse.

Discussion

In the current work, we tested whether any potentially debilitating effects of CSA severity on biological health may be buffered by a sense of meaning (assessed with both belief in a sense of control and eudaimonic well-being). We anticipated an adverse effect of CSA severity for those low in meaning. However, this adverse effect was anticipated to be weaker among those higher in meaning. The results were surprising. Across two measures of meaning, we found a consistent interaction between severity of CSA and meaning on biological health risk. Among those who experienced more minor CSA, meaning was associated with reduced biological health risk, and a lack of meaning was associated with increased biological health risk. However, severe

CSA predicted higher biological health risk for those higher in meaning, and lower biological health risk among those lower in meaning. Thus, counter to the predictions based on prior work, we found that meaning had a negative (rather than positive) effect on biological health among those who experienced severe CSA.

These data suggest that, among the severely sexually abused, these meaning-related factors backfire rather than buffer against ill health effects. It is unlikely that this effect is unreliable, emerging from random variation, because the pattern is consistent across the two measures, as well as consistent across all factors that comprise the measure of eudaimonic well-being (autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance). In interpreting the current findings, it is important to note that the observed interaction effect was unique to specifically sexual forms of childhood abuse. There were no interactions between sense of control or eudaimonic well-being with abuse severity when considering physical or emotional forms of abuse or neglect. Additionally, the observed pattern was limited to biological health, and was not reflected with respect to participants' self-rated health. These findings suggest that a sense of control and eudaimonic well-being might be double-edged swords when it comes to biological health. Previous research on those from the general population suggest that these traits are associated with better health (Elliot et al., 2018; Carver, Scheier, & Segerstrom, 2010). In the present research, we found this association among those whose abuse was low in severity. Thus, these traits are likely associated with better biological health under relatively optimal conditions.

There remains the question of why such a paradoxical effect occurs. There are multiple possibilities of why this may be the case. The first is informed from past research on traumatic

experiences. Prior evidence suggests that after experiencing traumatic loss, many people seek to find positive meaning in the experience (Davis et al., 2000). Likewise, CSA victims may also seek to gain some positive meaning following their experiences. However, this may be very difficult. Some victims may very well succeed in finding viable ways to develop a sense of eudaimonia, for example, finding a purpose in life through their profession or forming positive relationships with others through their significant other or children. Under traditional circumstances, these psychological traits may have a therapeutic effect, defraying any sense of threat or danger, and the sense of control and eudaimonic well-being these victims achieve may very well have therapeutic effects under most circumstances. However, as noted above, the effects of sexual abuse are uniquely different. A sense of eudaimonia achieved over the lifetime, such as developing a sense of purpose through work, may be in direct conflict with beliefs formed through the memory of CSA. This conflict would be particularly strong in those whose CSA was most severe. If an adult who was severely sexually abused believes themselves to have a sense of control over their environment or views themselves as high in factors of eudaimonic well-being such as a sense of autonomy, their beliefs exist in direct conflict with their life experiences. A child who is severely abused is by nature not in control over what is happening to them and has autonomy stripped from them. Thus, the adult would be living with two largely conflicting self-views—their feeling of well-being alongside the childhood memory that runs counter to eudaimonic well-being. Such a conflict may generate a feeling of threat, which would be particularly serious for those whose CSA was most severe. There is also a potential threat that the sense of eudaimonic well-being that one has developed is fragile and could be lost. These experiences of threat may activate biological defense mechanisms, namely pro-inflammatory

responses to threat. Held chronically, these responses would in turn compromise cardiovascular health. Although speculative at this point, this threat response mechanism might help us understand why the particular combination of severe CSA and a strong sense of control as well as a strong sense of eudaimonic well-being may pose a biological health risk. There are other potential causes, for example, those who were severely abused could be engaging in a particular behavior that increases their subjective sense of eudaimonic well-being yet is detrimental to physical health. Further, there may be some other psychological factors involved that are more related to clinical psychology, such as how the victims process their emotions related to the abuse or dissociation. However, the present data are not equipped to address those potential causes.

These findings are not inconsistent with prior research findings because there is no prior research finding that lends itself to direct comparison. Previous work either fails to isolate the role of sexual abuse, account for its severity, examine biological measures of health, or to assess potential moderators. As noted above, King et al. (2015) did not find a relationship between CSA and self-rated health in adulthood. They focused on a specific subset of the population (pregnant women) and did not account for the severity of the abuse experienced. The present finding, which examines a broader population and accounts for the severity of the abuse experienced, finds that there is, in fact, a relationship between the severity of sexual abuse experienced in childhood and one's perceptions of their current health in addition to their biological health. Also noted above, Fergusson, McLeod, & Horwood (2013) studied the relationship between CSA and physical health in adulthood. While they noted that CSA severity was linked with poorer physical health outcomes over age 30, their methods do not allow for direct comparison

of results. Their measure of CSA severity was categorical, based on the type of molestation that a child experienced, whereas CSA severity in the present sample is a continuous variable related to the frequency of abuse. Further, their measure of physical health was the number of times a participant visited the doctor in the past 12 months, rather than considering biomarkers of health risk or even self-rated health. Such a definition of physical health does not allow for comparison to the present sample, in which health was assessed with biomarkers and self-report. Further, they also defined well-being quite differently than the present research, and also did not measure whether well-being served as a moderator of the relationship between CSA severity and health. Rather than assessing eudaimonic well-being, Fergusson et al. considered a combination of PTSD symptoms, self-esteem, life satisfaction, and quality of the relationship with one's partner as one's sense of well-being. Thus, while Fergusson et al.'s work is a valuable contribution to the literature, it failed to address certain questions that have been investigated in the present work. The present work remedies a gap in the literature by addressing the relationship between the severity of CSA and biological measures of health among the general population. Additionally, it assesses the role of psychological factors that moderate the relationship between childhood abuse and adult health.

The current work relates the severity of abuse with its frequency, but future work should assess whether other factors of abuse besides severity affect its impact on adult health. Maniglio (2009) found that the age at which CSA occurred was the largest predictor of whether a victim later developed borderline personality disorder. Future work should examine whether age of abuse is linked with physical rather than only mental health outcomes. Also, future work should account for additional variables such as the amount of years that abuse occurred, as well as the

number of perpetrators or their relationship to the victims. Further, in addition to assessing more details about the CSA itself, future work would benefit from examining the role of other psychological traits as potential moderators of the relationship between CSA and BHR. Other psychological factors may serve to either buffer against or exacerbate the relationship between abuse and health. For example, there may be a link between CSA severity and neuroticism in adulthood, and neuroticism has been associated with poor health among Americans (Lahey, 2009).

The present work responds to a need in the literature by assessing potential moderators on the relationship between the severity of childhood sexual abuse and biological health in adulthood. For those who were severely abused, a sense of control and a sense of eudaimonic well-being fail to serve as a buffer against ill health. Instead, they appear to backfire; high sense of control and high eudaimonic well-being are linked with poorer health among the severely abused. Future work should further investigate this relationship in order to determine why this relationship exists. This effect is unique to sexual forms of childhood abuse, and future work can examine what factors of sexual abuse make it unique from physical or emotional abuse and neglect. Childhood sexual abuse is often overlooked, both in terms of how research largely focuses on abuse as a whole rather than specifically sexual abuse, and in how it is not discussed in society as often as other forms of abuse. Childhood sexual abuse is prevalent at an alarming rate; over 20% of the present sample experienced some amount of sexual abuse during their childhoods. Such a high rate demands that further research be done in order to highlight and examine the specific effects of this form of abuse.

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Table 8. *Descriptive statistics for all variables used*

	CSA victims	
	M	SD
Variable		
CSA severity	11.31	5.36
Psychological well-being	227.71	34.47
Sense of control	5.46	1.02
Health Measures		
BHR	0.05	0.97
IL-6	0.35	0.29
CRP	0.16	0.50
SBP	2.11	0.06
Ratio cholesterol	0.54	0.15
Rate health- current	7.35	1.60
Rate health- future	6.84	1.96
Demographics		
Sex (% female)	72.90	
Age	57.58	11.02
Education	7.38	2.52
Health Behaviors		
Smoking- current	-0.22	0.32
Smoking- former	0.02	0.48
Alcohol use	2.57	4.05
Health Status		
BMI	1.46	0.09
Comorbidity	3.03	2.44

Note. Ratio cholesterol refers to the ratio of total to HDL cholesterol. Values for the 4 biomarkers that comprise BHR, as well as BMI, are log-transformed.

Table 9. *Correlation coefficients for all independent and dependent variables*

	1	2	3	4	5	6	7
1. CSA	*						
2. PWB	-.18*	*					
3. SoC	-.19*	.74*	*				
4. BHR	0.11	-0.03	-0.06	*			
5. BMI	.26*	-0.12	-0.13	.57*	*		
6. Current health	-.22*	.42*	.34*	-.19*	-.27*	*	
7. Future health	-.12	.42*	.42*	-.15*	-.08	.71*	*

Note. PWB = psychological well-being; SoC = sense of control. "Current health" and "future health" refer to participants' self-rated health. Note that lower values of BHR are associated with better health.

Table 10. *Regression coefficients predicting BHR as a function of severity of childhood sexual abuse and sense of control.*

Biological Stress	Model 1			Model 2			Model 3			Model 4		
	b	se	p	b	se	p	b	se	p	b	se	p
Sense of control (SoC)	-0.16	0.10	0.10	-0.14	0.10	0.16	-0.14	0.10	0.17	-0.15	0.08	0.06
Childhood sexual abuse (CSA)	0.02	0.11	0.10	0.03	0.01	0.04	0.02	0.01	0.05	<.01	0.01	0.97
SoCxCSA	0.02	0.16	0.11	0.02	0.01	0.12	0.02	0.01	0.11	0.02	0.01	<.01
Sex				-0.18	0.15	0.22	-0.20	0.15	0.20	0.01	0.13	0.92
Age				0.01	0.01	0.19	0.01	0.01	0.20	0.02	0.01	<.01
Education				-0.03	0.03	0.25	-0.02	0.03	0.38	-0.02	0.02	0.43
Alcohol consumption							-0.01	0.02	0.49	0.01	0.01	0.44
Former smoker							0.16	0.14	0.25	0.02	0.11	0.86
Current smoker							0.22	0.21	0.31	0.38	0.17	0.03
BMI										6.90	0.63	<.01
Comorbidity w/ disease										< -.01	0.02	0.92

Note. $N = 237$

Table 11. *Regression coefficients predicting BHR as a function of severity of childhood sexual abuse and psychological well-being.*

Biological Stress	Model 1			Model 2			Model 3			Model 4		
	b	se	p	b	se	p	b	se	p	b	se	p
Psychological well-being (PWB)	< -.01	<.01	0.64	< -.01	<.01	0.55	< -.01	<.01	0.54	-0.01	<.01	0.85
Childhood sexual abuse (CSA)	0.02	0.01	0.09	0.03	0.01	0.04	0.02	0.01	0.05	< -.01	0.01	0.90
PWBxCSA	<.01	<.01	0.06	<.01	0.01	0.05	<.01	<.01	0.05	<.01	<.01	<.01
Sex				-0.04	0.15	0.18	-0.21	0.15	0.18	0.01	0.13	0.97
Age				0.01	0.01	0.15	0.01	0.01	0.16	0.02	0.01	<.01
Education				-0.03	0.03	0.26	-0.02	0.03	0.40	-0.02	0.02	0.47
Alcohol consumption							-0.01	0.02	0.53	0.01	0.01	0.36
Former smoker							0.16	0.14	0.25	0.01	0.11	0.93
Current smoker							0.21	0.21	0.32	0.37	0.17	0.03
BMI										6.92	0.62	<.01
Comorbidity w/ disease										-0.01	0.02	0.83

Note. $N = 237$

Table 12. *Regression coefficients predicting participant ratings of their current health as a function of severity of childhood sexual abuse and sense of control.*

Ratings of current health	Model 1			Model 2			Model 3			Model 4		
	b	se	p	b	se	p	b	se	p	b	se	p
Sense of control (SoC)	0.62	0.15	<.01	0.60	0.15	<.01	0.55	0.15	<.01	0.44	0.14	<.01
Childhood sexual abuse (CSA)	-0.05	0.02	<.01	-0.05	0.02	0.01	-0.05	0.02	0.01	-0.04	0.02	0.05
SoCxCSA	-0.02	0.02	0.25	-0.02	0.02	0.12	-0.02	0.02	0.21	-0.02	0.01	0.15
Sex				0.03	0.22	0.90	-0.03	0.23	0.91	0.10	0.23	0.65
Age				0.02	0.01	0.07	0.01	0.01	0.18	0.01	0.01	0.25
Education				0.05	0.04	0.23	0.04	0.04	0.31	0.03	0.04	0.39
Alcohol consumption							-0.02	0.03	0.47	-0.03	0.02	0.26
Former smoker							0.19	0.21	0.37	0.31	0.20	0.12
Current smoker							-0.71	0.32	0.03	-0.55	0.30	0.07
BMI										-2.28	1.09	<.01
Comorbidity w/ disease										-0.19	0.04	<.01

Note. $N = 239$

Table 13. *Regression coefficients predicting participant ratings of their projected health 10 years in the future as a function of severity of childhood sexual abuse and sense of control.*

Ratings of future health	Model 1			Model 2			Model 3			Model 4		
	b	se	p	b	se	p	b	se	p	b	se	p
Sense of control (SoC)	1.12	0.17	<.01	0.14	0.17	<.01	1.11	0.17	<.01	0.96	0.16	<.01
Childhood sexual abuse (CSA)	-0.02	0.02	0.29	-0.03	0.02	0.13	-0.04	0.02	0.10	-0.03	0.02	0.16
SoCxCSA	-0.06	0.02	<.01	-0.05	0.02	<.01	-0.05	0.02	<.01	-0.05	0.02	<.01
Sex				0.31	0.26	0.24	0.33	0.28	0.24	0.66	0.27	0.01
Age				-0.02	0.01	0.03	-0.02	0.01	0.02	-0.02	0.01	0.03
Education				0.09	0.05	0.06	0.08	0.05	0.08	0.07	0.04	0.11
Alcohol consumption							0.01	0.03	0.82	0.01	0.03	0.67
Former smoker							0.17	0.25	0.49	0.22	0.23	0.34
Current smoker							-0.46	0.38	0.23	-0.17	0.36	0.65
BMI										0.35	1.29	0.79
Comorbidity w/ disease										-0.28	0.05	<.01

Note. $N = 239$

Table 14. *Regression coefficients predicting participant ratings of their current health as a function of severity of childhood sexual abuse and psychological well-being.*

Ratings of current health	Model 1			Model 2			Model 3			Model 4		
	b	se	p	b	se	p	b	se	p	b	se	p
Psychological well-being (PWB)	0.02	<.01	<.01	0.02	<.01	<.01	0.02	<.01	<.01	0.01	<.01	<.01
Childhood sexual abuse (CSA)	-0.05	0.02	0.01	-0.05	0.02	0.01	-0.05	0.02	0.01	-0.03	0.02	0.07
PWBxCSA	<.01	<.01	0.39	<.01	<.01	0.40	<.01	<.01	0.41	<.01	<.01	0.38
Sex				0.03	0.22	0.90	-0.03	0.23	0.91	0.12	0.22	0.60
Age				<.01	0.01	0.80	< -.01	0.01	0.96	< -.01	0.01	0.88
Education				0.04	0.04	0.33	0.03	0.04	0.45	0.02	0.04	0.65
Alcohol consumption							-0.02	0.03	0.54	-0.02	0.02	0.31
Former smoker							0.09	0.21	0.66	0.22	0.19	0.25
Current smoker							-0.70	0.31	0.03	-0.50	0.29	0.09
BMI										-3.10	1.10	<.01
Comorbidity w/ disease										-0.20	0.04	<.01

Note. N = 239

Table 15. *Regression coefficients predicting participant ratings of their projected health 10 years in the future as a function of severity of childhood sexual abuse and psychological well-being.*

Ratings of future health	Model 1			Model 2			Model 3			Model 4		
	b	se	p	b	se	p	b	se	p	b	se	p
Psychological well-being (PWB)	0.02	<.01	<.01	0.02	<.01	<.01	0.02	<.01	<.01	0.02	<.01	<.01
Childhood sexual abuse (CSA)	-0.02	0.02	0.31	-0.03	0.02	0.11	-0.04	0.02	0.10	-0.03	0.02	0.18
PWBxCSA	< -.01	<.01	<.01	< -.01	<.01	<.01	< -.01	<.01	<.01	< -.01	<.01	0.01
Sex				0.34	0.26	0.19	0.35	0.27	0.19	0.70	0.26	0.01
Age				-0.04	0.01	<.01	-0.04	0.01	<.01	-0.04	0.01	<.01
Education				0.08	0.05	0.08	0.07	0.05	0.12	0.06	0.04	0.19
Alcohol consumption							0.01	0.03	0.75	0.02	0.03	0.58
Former smoker							0.02	0.24	0.93	0.09	0.23	0.70
Current smoker							-0.46	0.37	0.22	-0.12	0.35	0.74
BMI										0.45	1.25	0.72
Comorbidity w/ disease										-0.29	0.05	<.01

Note. N = 239

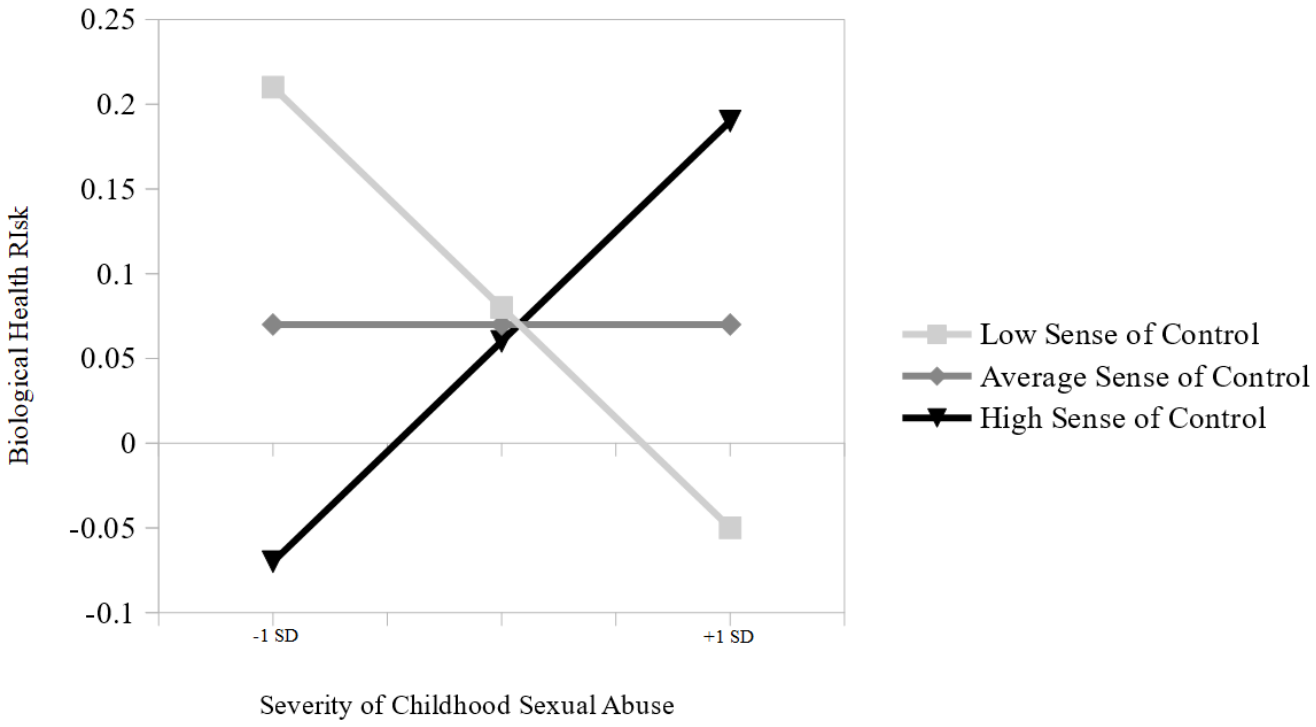

Figure 4. The relationship between childhood sexual abuse severity and biological health risk (BHR) as a function of sense of control. Lower values of BHR indicate better health.

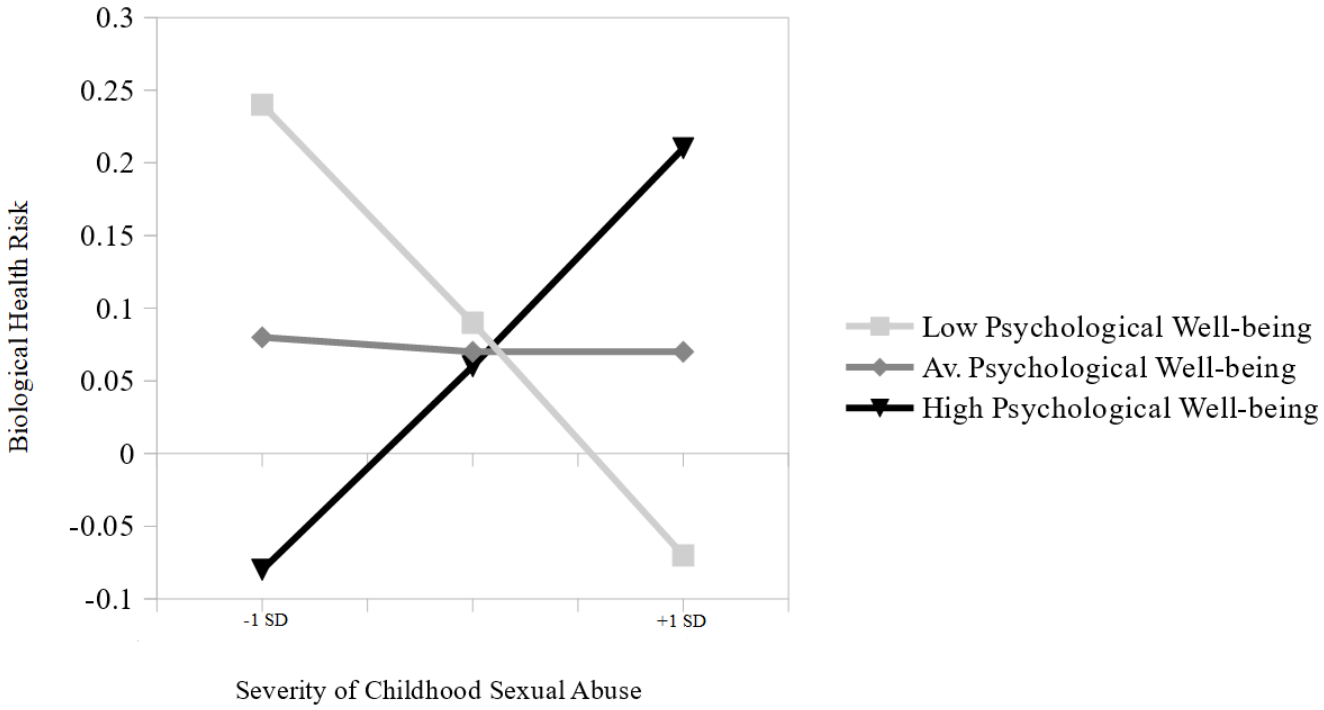

Figure 5. The relationship between childhood sexual abuse severity and biological health risk (BHR) as a function of psychological well-being. Lower values of BHR indicate better health.

Chapter 5
Conclusion

The preceding chapters provided evidence that socio-cultural and personal factors interact with factors associated with meaning, such as eudaimonic well-being, to influence both perceptions of health and biological health. Both the presence of a relationship between eudaimonic well-being and health and the direction of said relationship were associated with socio-cultural and personal factors. Specifically in this research, the relationship of eudaimonic well-being and health was examined in two contexts: cross-cultural comparison and victims of sexual assault and abuse.

Chapter 2 addressed the relationship between purpose in life, a component of eudaimonic well-being and health, assessing whether such a relationship is present across cultures. Focusing specifically on purpose in life was of particular interest given past research noting a relationship between purpose in life and positive health outcomes (Hill & Turiano, 2014; Ryff, Singer, & Love, 2004). However, such previous work has ignored potential social costs that may result from purpose, particularly if one has a personally-focused purpose. Within an interdependent culture that values social harmony, a strong focus on purpose could be seen as a focus on the self and lead to social tension. Social strife can lead to increased stress (Cacioppo et al., 2015), so it was hypothesized that purpose in life may not be directly linked with biological health in such an interdependent cultural context. Chapter 2 sought both to examine if this were the case, as well as to find whether social virtue that signals one's commitment to social harmony might offset any negative views of purpose in such a cultural context. Specifically, it examined whether gratitude

may serve as such a social virtue. This proved to be the case. Among Americans, purpose in life was associated with lower biological health risk regardless of gratitude, whereas in Japan, which is more interdependent, purpose in life was associated with lower biological health risk only among those high in gratitude. Further, gratitude itself was predictive of biological health risk among Japanese but not in Americans. This may seem strange given previous research noting that gratitude has positive effects among Americans, such as reduced feelings of depressive symptoms (Seligman et al., 2005). However, such research examines gratitude as a social practice instead of a personal trait. Further, it is important to keep in mind the present research assesses the relationship between gratitude and biological measures of health. Gratitude may have positive subjective outcomes among Americans while at the same time having no association with underlying biological health. Gratitude and purpose in life are both potentially salubrious. In cultures that place a strong value on interdependence with others, the presence of gratitude may facilitate purpose's potential to yield better biological health outcomes. Ultimately, while eudaimonic well-being is associated with health in some contexts, its relationship to health appears to be more nuanced in a collectivist cultural context.

Chapters 3 and 4 moved away from studying the relationship between eudaimonic well-being and health across cultures and instead examined sub-populations within American culture: those who reported having experienced a sexual assault and those who reported being subjected to childhood sexual abuse. It was suspected that these experiences would be linked with biological health outcomes due to previous research addressing the relationship between adverse life events and health.

Developmental trauma in particular is associated with chronic inflammation even in adulthood (Miller et al., 2011), as well as negative health outcomes such as obesity (Greenfield

& Marks, 2009). While previous research largely addresses the relationship between developmental trauma in particular, we speculated whether lifetime incidence of adverse experience could be related to biological health outcomes as well. Additionally, Chapters 3 and 4 addressed whether the victims of sexual assault and abuse are still capable of crafting a sense of meaning in life or eudaimonic well-being, and if so, if they are capable of drawing health benefits from any sense of eudaimonic well-being that they do manage to acquire. Although it is traditionally assumed that most individuals will draw psychological and even biological benefits from meaning in life, certain life events such as sexual trauma may make it extremely challenging to craft or sustain any coherent meaning in life.

In particular, Chapter 3 tested whether an experience of sexual assault might impede subsequent eudaimonic well-being. We expected that this debilitating effect of sexual assault would be very likely. However, it is not clear whether the compromised sense of eudaimonic well-being might also be linked to impairment in physical or biological health. We found, perhaps unsurprisingly, that the victims of sexual assault reported a lower sense of eudaimonic well-being than their peers. However, victims of lifetime incidence of sexual assault did not fare differently than others with respect to biological health risk. They did, however, report a greater number of chronic conditions and rated their health to be more poor than those who have never been sexually assaulted rated themselves. Sexual assault history (or lack thereof) was correlated with self-rated health yet not biological health risk, suggesting that among those who have experienced lifetime sexual assault, there may be a negatively biased schema that lends itself to viewing one's health as poor. Among victims themselves, eudaimonic well-being was associated with self-rated health, though eudaimonic well-being was not associated with participants' subjective ratings of the long-term effect that the assault had on their life.

Chapter 4 followed up on the suggestion from Chapter 3 that the experience of sexual assault does compromise the ability to craft a full meaning in life and, yet, it did not influence biological health. We reasoned that the lack of any effect of sexual assault on biological health might have been due to the fact that the sexual assaults assessed in Chapter 3 were likely mostly isolated; they likely may not have been either recursive or chronic. There was no measure of their severity or frequency. People might be able to protect their biological health even when their ability to craft their sense of meaning in life is compromised to some degree. Chapter 4 addresses those who have been victimized sexually during childhood, accounting for frequent abuse. We hypothesized that repeated abuse (termed severe abuse by the scale of measurement) was likely to have adverse biological effects. Specifically, we addressed the relationship between childhood sexual abuse and biological health outcomes in adulthood. The chapter addressed how the severity of such abuse is related to health, as well as how a sense of control and a sense of eudaimonic well-being, psychological factors related to a sense of meaning, interact with abuse severity to predict biological health in adulthood. Previous research on the effects of childhood abuse, e.g. Danese et al. (2007), largely focuses on the effects of overall childhood maltreatment, and thus is not informative regarding the uniqueness of childhood sexual abuse. Our research found that the severity of childhood sexual abuse experienced predicts biological health risk in adulthood, and further, that there is a reliable interaction between the severity of sexual abuse experienced and both a sense of control and a sense of eudaimonic well-being.

For those whose sexual abuse was reportedly minor, these psychological traits were associated with lower biological health risk. Surprisingly, however, for those whose sexual abuse was reportedly severe, these traits were associated with significantly higher biological health risk. These interaction effects were unique to biological health risk, an objective rating of health,

and were not present with respect to participants' subjective ratings of their health. Further, these interaction effects were unique to childhood sexual abuse in particular and were not present for other types of childhood adversity, such as physical or emotional abuse. Our findings suggest that severe childhood sexual abuse leaves a traumatic memory and damages one's sense of meaning. Victims of severe childhood sexual abuse may experience conflict and thus a constant sense of threat when they develop meaning in life, which is in conflict with their past experiences. This conflict, as well as the threat of losing what meaning they have developed, may lead to a chronic sense of threat, a source of biological strain. The paradoxical finding could also potentially be explained by research in clinical psychology. Those who were severely abused yet reported a high sense of well-being may be experiencing dissociation, a psychological experience that creates a feeling of disconnect between the mind and the body. Those who faced the worst abuse and whose health suffers from it may (unconsciously) dissociate from their experiences, in a sort of repression, and report that they feel good about their life. Overall, the research in Chapter 4 finds that, in some contexts, eudaimonic well-being could have an adverse effect on health, counter to assumptions that eudaimonic well-being is universally good.

General discussion

The findings of these studies call into question the prevailing assumption that meaning, assessed by eudaimonic well-being in each study, is directly associated with positive health effects. One cannot make the generalization that eudaimonic well-being is always good for health. Chapter 2 finds that, in Japan, a sense of purpose in life is only associated with positive health among those who are also high in gratitude. This may be due to cultural norms related to interdependence. Among those who were victims of an incidence of sexual assault, eudaimonic well-being was not correlated with biological health, as addressed in Chapter 3. Further, Chapter

4, finds that among those who have experienced severe sexual abuse as children, the relationship between the severity of abuse and biological health in adulthood is moderated by a sense of eudaimonic well-being. However, this relationship runs counter to expectations, and a strong sense of well-being is related to worse health outcomes among those who experienced the most severe abuse. Whether or not eudaimonic well-being is associated with health benefits is contingent on socio-cultural factors, such as one's culture, or personal factors such as adverse life experiences and the severity of said experiences. There is not a straightforward finding in which a sense of eudaimonic well-being is universally associated with better biological health. Future research should further investigate how such socio-cultural factors influence the relationship between well-being and health, as well as question the universality of other factors on which eudaimonic well-being is assumed to have a salubrious effect.

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Appendix A

Psychological Well-being Scale

(Ryff & Keyes, 1995)

Items arranged by subscale

Directions: The next set of items explore your well-being. Please indicate how strongly you agree or disagree with each of the following statements.

	Agree				**Disagree**	
Strongly	Somewhat	A little	Neither agree nor disagree	A little	Somewhat	Strongly
1	2	3	4	5	6	7

Autonomy

a. I am not afraid to voice my opinions, even when they are in opposition to the opinions of most people. (R)
g. My decisions are not usually influenced by what everyone else is doing. (R)
m. I tend to be influenced by people with strong opinions.
s. I have confidence in my opinions, even if they are contrary to the general consensus. (R)
y. It's difficult for me to voice my own opinions on controversial matters.
ee. I tend to worry about what other people think of me.
kk. I judge myself by what I think is important, not by the values of what others think is important. (R)

Environmental Mastery

b. In general, I feel I am in charge of the situation in which I live. (R)
h. The demands of everyday life often get me down.
n. I do not fit very well with the people and the community around me.
t. I am quite good at managing the many responsibilities of my daily life. (R)
z. I often feel overwhelmed by my responsibilities.
ff. I have difficulty arranging my life in a way that is satisfying to me.
ll. I have been able to build a living environment and a lifestyle for myself that is much to my liking. (R)

Personal Growth

c. I am not interested in activities that will expand my horizons.
i. I think it is important to have new experiences that challenge how you think about yourself and the world. (R)
o. When I think about it, I haven't really improved much as a person over the years.

u. I have the sense that I have developed a lot as a person over time. (R)
aa. For me, life has been a continuous process of learning, changing, and growth.
gg. I gave up trying to make big improvements or changes in my life a long time ago.
mm. I do not enjoy being in new situations that require me to change my old familiar ways of doing things.

Positive Relations with Others
d. Most people see me as loving and affectionate. (R)
j. Maintaining close relationships has been difficult and frustrating for me.
p. I often feel lonely because I have few close friends with whom to share my concerns.
v. I enjoy personal and mutual conversations with family members and friends. (R)
bb. People would describe me as a giving person, willing to share my time with others. (R)
hh. I have not experienced many warm and trusting relationships with others.
nn. I know that I can trust my friends, and they know they can trust me.

Purpose in Life
e. I live life one day at a time and don't really think about the future.
k. I have a sense of direction and purpose in life. (R)
q. I don't have a good sense of what it is I'm trying to accomplish in life.
w. My daily activities often seem trivial and unimportant to me.
cc. I enjoy making plans for the future and working to make them a reality. (R)
oo. Some people wander aimlessly through life, but I am not one of them. (R)
qq. I sometimes feel as if I've done all there is to do in life.

Self-Acceptance
f. When I look at the story of my life, I am pleased with how things have turned out. (R)
l. In general, I feel confident and positive about myself. (R)
r. I feel like many of the people I know have gotten more out of life than I have.
x. I like most aspects of my personality. (R)
dd. In many ways, I feel disappointed about my achievements in life.
jj. My attitude about myself is probably not as positive as most people feel about themselves.
pp. When I compare myself to friends and acquaintances, it makes me feel good about who I am. (R)

(R) indicates a reverse-scored item.

Appendix B

Checklist of chronic conditions

In the past twelve months, have you experienced or been treated for any of the following?

(Check all that apply.)

☐ a. Asthma, bronchitis, or emphysema

☐ b. Tuberculosis

☐ c. Other lung problems

☐ d. Arthritis, rheumatism, or other bone or joint diseases

☐ e. Sciatica, lumbago, or recurring backache

☐ f. Persistent skin trouble (e.g. eczema)

☐ g. Thyroid disease

☐ h. Hay fever

☐ i. Recurring stomach trouble, indigestion, or diarrhea

☐ j. Urinary or bladder problems

☐ k. Being constipated all or most of the time

☐ l. Gall bladder trouble

☐ m. Persistent foot trouble (e.g. bunions, ingrown toenails)

☐ n. Trouble with varicose veins requiring medical treatment

☐ o. AIDS or HIV infection

☐ p. Lupus or other autoimmune disorders

☐ q. Persistent trouble with your gums or mouth

☐ r. Persistent trouble with your teeth

☐ s. High blood pressure or hypertension

☐ t. Anxiety, depression, or some other emotional disorder

☐ u. Alcohol or drug problems

☐ v. Migraine headaches

☐ w. Chronic sleeping problems

☐ x. Diabetes or high blood sugar

☐ y. Multiple sclerosis, epilepsy, or other neurological disorders

☐ z. Stroke

☐ aa. Ulcer

☐ bb. Hernia or rupture

☐ cc. Piles or hemorrhoids

☐ dd. Swallowing Problems

Appendix C
Childhood Trauma Questionnaire

(Bernstein & Fink, 1998)

Items arranged by subscale

Directions: These questions ask about some of your experiences growing up as a child and a teenager. For each question, circle the number that best describes how you feel. Although some of these questions are of a personal nature, please try to answer as honestly as you can. Your answers will be kept confidential.

Never true	Rarely true	Sometimes true	Often true	Very often true
1	2	3	4	5

When I was growing up...

Emotional Abuse

3. People in my family called me things like “stupid,” “lazy,” or “ugly.”

8. I thought my parents wished I had never been born.

14. People in my family said hurtful or insulting things to me.

18. I felt that someone in my family hared me.

25. I believe that I was emotionally abused.

Physical Abuse

9. I got hit so hard by someone in my family that I had to see a doctor or go to the hospital.

11. People in my family hit me so hard that it left me with bruises or marks.

12. I was punished with a belt, a board, a cord, or some other hard object.

15. I believe that I was physically abused

17. I got hit or beaten so badly that it was noticed by someone like a teacher, neighbor, or doctor.

Sexual Abuse

20. Someone tried to touch me in a sexual way or tried to make me touch them.

21. Someone threatened to hurt me or tell lies about me unless I did something sexual with them.

23. Someone tried to make me do sexual things or watch sexual things.

24. Someone molested me.

27. I believe that I was sexually abused.

Emotional Neglect

5. There was someone in my family who helped me feel that I was important or special. (R)

7. I felt loved. (R)

13. People in my family looked out for each other. (R)

19. People in my family felt close to each other. (R)

28. My family was a source of strength and support. (R)

Physical Neglect

1. I didn't have enough to eat.

2. I knew that there was someone to take care of me and protect me. (R)

4. My parents were too drunk or high to take care of the family.

6. I had to wear dirty clothes.

26. There was someone to take me to the doctor if I needed it. (R)

Minimization/Denial

10. There was nothing I wanted to change about my family.

16. I had the perfect childhood.

22. I had the best family in the world.

(R) indicates a reverse-scored item.